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THE EFFECTS ON FARM OPERATING UNITS OF LAND ACQUISITION FOR CONTROLLED-ACCESS HIGHWAYS

U.S. DEPARTMENT OF AGRICULTURE
Economic Research Service
Farm Economics Division

PREFACE

Two approaches to the study of highway impact in rural areas offer promise of providing valuable information. The first, which is of most immediate usefulness to the right-of-way appraiser, is to study in detail the individual farm units from which land is sold for highway use. The second kind of study seeks to assess more broadly the economic impact of a highway improvement on the agricultural community it serves.

The present study was conceived as a compromise between these alternative approaches. Primarily because of the limitations on research resources, neither an intensive farm-management study nor one covering adequately the broader community impacts could be undertaken. The alternative reported, however, presents findings of potential help to appraisers, highway planners, and right-of-way engineers. Although it does not supply all the answers they wish, it provides, from the experience of the farmers along Interstate 35, a number of guides to appraisal of partial takings, location and design of major controlled-access facilities, acquisition of right-of-way, and purchase and resale of excess land to facilitate farm adjustment.

Many of the effects detailed in the following chapters can be considered to be adverse consequences of the highway for the farm operating units studied. However, payments for both the land taken and the damages to the remaining property must be kept in mind in any assessment of the net effect of the highway. Because a major aim of the study reported was to provide information on the effects that might enter into the appraisal, rather than on what is done with the compensation, emphasis is on the directly observable consequences, many of which are adverse.

Conducting a study of this kind would be very difficult without the cooperation of numerous agencies concerned both with highway building and with agriculture. E. V. John, Right-of-Way Engineer for the State of Iowa, gave time and advice, provided us with help from his staff, and gave us access to relevant Highway Commission records. Vernon E. Harvey, Division Planning Engineer for the Bureau of Public Roads, participated actively in the early planning of the study. James K. Hatcher, Office Manager for the Agricultural Stabilization and Conservation Committee in Warren County, helped repeatedly by providing needed information on farm operating units in his County. We wish also to thank ASCS County Office personnel in Dallas and Polk Counties for similar assistance. The collection of data on sales of land was greatly helped by the cooperation of the staffs of the Warren County Assessor and of the Recorder in both Warren and Polk Counties.

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THE EFFECTS ON FARM OPERATING UNITS OF LAND ACQUISITION FOR CONTROLLED-ACCESS HIGHWAYS

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SUMMARY

How farmers adjust to the loss of part of their real estate to highway rights-of-way was the focus of this study. The 3-year history of 80 farms crossed by Iowa Interstate Route 35 was examined. Operators were interviewed concerning certain features of these farm operating units for the crop year 1956 - the crop year immediately preceding the right-of-way taking - and for the crop year 1959. Data on significant changes in intervening years were collected also. To provide a control to help in isolating the effects of the highway taking, an additional group of 82 farms in the area was selected by laying out a hypothetical right-of-way parallel to, but 3 miles distant from, the study segment. Operators in this "control" group were asked the same questions as the operators in the "taking" group, and the data from the two samples were then compared.

The 33 miles of Interstate 35 examined took all or part of six sets of farm buildings and just under 7 percent of the farmland in the 80 sample operating units. Voluntary sales of excess land to the Highway Commission and the resale of some of this exess land to sample farms raised the decrease in average size of farm to about 10 percent. Despite this loss of land from highway taking and sales of excess, taking-group farms between 1956 and 1959 showed approximately the same rate of increase in average acreage as the control-group farms. More than half, however, failed to regain their 1956 acreage.

The taking-group farms showed a substantially higher rate of disappearance over the study period than did the control-group farms. Three-fifths of the former were involved in real estate transactions, compared with one-third of the latter. In two other aspects explored in the study, the tenure pattern and the rate of turnover of farm operators, no differences between the groups were apparent. Differences in the use of hired labor and in the off-farm work of the farm family were in the direction expected, but they were not large. Both groups showed considerable variability as to size of crop and livestock enterprises. The taking group showed greater variability for crop enterprises, but little difference was apparent in the overall variability of livestock enterprises. No noteworthy differences in machinery investment were detected.

It was clear that the highway substantially increased the dispersion of the land operated by taking-group farms, in terms of the number of farms operating separated parcels, the number and acreage of the separated parcels

and the distance of these tracts from the farm headquarters. While the Highway Commission played the major role in helping farmers to dispose of separated tracts, many such tracts were retained in the farm units. Others were disposed of through normal market channels.

The report closes with an appraisal of the study methods used and suggestions for the conduct of further research on this subject. An appendix explores relevant aspects of the right-of-way acquisition policies and procedures.

CHAPTER 1 - NATURE OF THE STUDY

With the passage of the Federal Aid Highway Act of 1956, the Congress launched a gigantic highway-improvement program. In addition to the 41,000 miles of the National System of Interstate and Defense Highways authorized by this act, States will construct other high-design highways. This network of roads will have a multitude of effects on urban and farm communities. Unfortunately, little is known about these effects. This is particularly true of the effects on farms of right-of-way taking for these high-design highways.

The Interstate type of highway with its complete control of access is a recent phenomenon in most States. The land, grade, entrance, and exit requirements are new. Rights-of-way for the Interstate system will require strips of land averaging 250 to 300 feet in width. Interchanges to speed vehicles to and from the system may require an average of 40 acres. These interchanges, the points of entrance and exit to the Interstate highway, may be 6 to 10 miles apart in farm areas. Crossings of the highway may be 2 to 6 miles apart.

The Interstate system displays other important features in farm areas. Most of the 41,000 miles of highway will be constructed through rural areas. Of the 1.5 million acres of land needed for new rights-of-way, three-fifths will be taken from land in farms. 1/ Because of the greater width required for the Interstate rights-of-way, any one farmer can lose a sizable fraction of his land. Another feature is that these highways do not follow established section lines. Frequently, they pass through the centers of sections and sometimes cut through sections on an angle. By crossing sections in this way, the Interstate highways cut farms in a variety of ways, leaving many with parcels of land on the opposite side of the road from the rest of the farm. As there is no direct access to the highway, the land on the opposite side of the road may be several highway miles away.

Little information is available as to the immediate effects of right-of-way acquisition on farm ownership tracts or on the operating units to which these ownership tracts are attached. Even less information is available on the changes in operating units over time caused by these controlled-access highways. Particularly is information lacking concerning such a highway's influence through time on the size and number of farms, on resource use (including the use of separated parcels of land), on enterprise combinations, on farm-adjustment patterns, and on real estate transfers.

1/ For a discussion of the use, ownership, and capability characteristics of land required for the Interstate System see: U.S. Agricultural Research Service, Farm Economics Research Division, The Economic Impact of Highway Improvement, March 1959, pp. 75-83.

Information on these several items will be helpful to highway agencies concerned with minimizing adverse local effects of Interstate highways in rural areas. In particular, this information will assist highway agencies to evaluate procedures for determining alignment of highways, location of companion structures such as overpasses, and procedures for acquiring and disposing of real estate in the path of the road. In addition, this information will be useful to those valuing farm property. The nature of the farm operating unit after right-of-way acquisition, which is a focal point of the study reported, must be predicted by a right-of-way appraiser.

Objectives of the Study

The study had two major objectives. One objective was to provide some information concerning the effects of the construction of Interstate highways on farm operating units. The effects considered are those having economic significance for the organization and operation of farms and the use of farm resources. The second objective was to develop a methodology for assessing these agricultural effects.

Research projects that explore the effects on farms of high-design highways are being considered by several highway departments. Because of the newness of this general type of research, this report should provide guidance to State Highway Departments in planning these studies.

Determine effects on farms

Three main groups of effects were considered and analyzed. The first includes the general effects of an Interstate highway on the many farms in its path. Six items are included in this group: (1) Disappearance of operating units; (2) turnover of farm operators; (3) tenure pattern of farm operating units; (4) frequency of real estate transactions; (5) prices received or paid for real estate; and (6) change in size of farm.

The second group encompasses the effects of the highway on the use of land and buildings within the farm operating unit. Four items are considered: (1) Nature and extent of segmentation of land and buildings; (2) disposition of separated parcels; (3) use of separated parcels retained in farm unit; and (4) dispersion of land in operating units.

The third group of effects considered were those relating to the use of labor and capital by the farm operating unit. The following four items are analyzed: (1) Off-farm, nonagricultural work by the operator and his family; (2) hired labor employed; (3) investment in machinery; and (4) enterprise variability.

In addition to these three major groups of effects of highway taking, some of the implications of highway planning and land-acquisition procedures are analyzed. In presenting findings for each of these several groups, specific examples of adjustments made by individual farm operators are included. These examples will serve to highlight certain paths of adjustment made by farm operators to such conditions as loss of land and separation of property brought about by the Interstate highway.

Develop a research method

A major problem in any highway-impact study is identification of those changes in areas adjacent to a highway that can be attributed to the highway. Not all the observed changes result from highway construction. Both urban and farm areas through which highways pass may have been undergoing changes before highway construction occurred. [2] Further, some of the changes that have their origin in causes other than the highway may continue after the highway is built. As an added complication, construction of the highway may accelerate or retard them. Thus, any research that attempts to measure changes attributable to a highway must also measure the changes that probably would have occurred without the highway. Such a procedure helps to avoid research conclusions that either exaggerate or underestimate the effects of the highway construction.

Design of the Study

To fulfill the objective of developing a research methodology, a technique was established for measuring the effects of an Interstate highway on a group of farm operating units in its path. The technique used had two main characteristics. First, it included a modified "before and after" study. Measurements were made of farm operating units in the path of the highway for the crop years 1956 and 1959. Both measurements were obtained by interview in 1959.

The "before and after" characteristic is "modified" because some changes in farm operations occurring during the intervening years are measured. It is further modified by exploration and presentation of adjustment paths followed by some farm operating units during the intervening period. However, this modified "before and after" measurement of farms in the roadway path would not in itself assure an accurate determination of farm change attributable to the highway. Farm changes not caused by the highway but which occurred in the area during the study period must also be measured.

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[2] For an example of change in an urban area not attributable to highway construction, see D. Gustafson and E. G. Smith, Jr., A Highway Change in Changing Faribault. Minnesota Highway Research Project, University of Minnesota, September 1959.

To accomplish this measurement of farm changes not attributable to the highway, a control group of farms was selected and used. Use of this control group is the second major characteristic of the research technique. The control group is composed of farms similar to those that were in the path of the roadway. Measurements were made of these farm operating units for the same years as for farms in the path of the roadway. The results of these measurements of control farms show the changes outside the immediate influence of the highway that were occurring on the farms. Further, the results indicate the observed changes on farms in the path of the highway that probably should not be attributed to the highway.

Choosing the highway segment

As a major objective of the project was to study the effects of Interstate highways on farms, the segment of highway selected had to have certain characteristics: (1) Design equal to Interstate standards. This includes full control of access, intervals of more than a mile between crossings, and rights-of-way widths similar to those of the Interstate System roads. (2) The segment of highway should be constructed on new rights-of-way. This is reasonable because the major portion of all Interstate System roads in rural areas will be constructed on new rights-of-way. (3) The segment should pass through an area that has remained in agriculture. This requirement minimizes the urban influence on land use and the added complications presented by it. (4) The agricultural area through which the highway passes should be fairly uniform as to type, size, and quality of farms. Uniformity is necessary to allow aggregation of data for farms in the road path. It is necessary also in selecting a control or check group of farms similar in number and type to those in the path of the highway. (5) The highway segment should be long enough to permit observations on a fairly large number of farms. The larger number allows the detection of smaller absolute changes or rates of change in farm operations. (6) The highway segment should have been in existence sufficiently long to allow its effects to become evident. As a first approximation, 6 to 10 years was considered a desirable period of time.

The States of Illinois, Indiana, Iowa, Kansas, Maryland, Missouri, and Ohio were visited to check highway segments that showed promise of suitability for the study. Although several segments of highway were found which met the time and agricultural requirements, in general they lacked the design requirements of Interstate System roads, particularly the full control of access.[3] A review of the available highway segments indicated that no single area had all characteristics sought. Therefore, it became necessary to choose the segment that would meet most of the requirements or at least the most critical ones.

Complete control of access, alignment on new rights-of-way, length of segment, and passage through an agricultural area seemed to be more critical for the success of the study than the 6 to 10 year time-period requirement. There were several reasons for this conclusion: (1) Personal interviews with farmers about their operations more than 3 or 4 years earlier might well lead to incomplete and inaccurate results. (2) Agricultural Stabilization and Conservation records, which were to be a major source of information about farm operating units, usually are not kept by the ASC offices beyond 5 years. (3) Some of the effects on farm operating units from construction of the highway are visible during the first crop year after the right-of-way for the highway is acquired. It was concluded that the time requirement could be reduced. Therefore, the available highway segments were reviewed and a segment of Iowa Interstate Route 35 was selected.

This segment of highway is a four-lane divided highway with complete control of access. It runs north and south along the western edge of Warren and Polk Counties in Iowa (fig. 1). It was constructed on new rights-of-way and cuts through the centers of farm sections with enough deviation from the center line to cause the splitting of a number of farm operating units. The portion of highway selected is 33 miles long; it stretches from the Clark-Warren County line north through Warren County into Polk County to a point 9 miles north of the Warren-Polk County line. The area through which the segment passes seems to be a fairly homogeneous area which has remained in agriculture.

The length of the highway segment, plus the apparent uniformity of agriculture in the area, made possible the inclusion of 80 farm operating units in the study sample. In addition, 82 control farms, similar to those in the path of the highway, were selected in the same area.

The total length of time the project had been in existence, - under construction and open to traffic - was 3 years. Rights-of-way were acquired in late 1956 and early 1957. Therefore, the last normal crop year for those farms in the path of the roadway was 1956. Construction was undertaken in 1957, and the highway was open for use in

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[3] Although the toll roads met the physical requirements, other characteristics such as land acquisition and payment policies and highway alignment and design practices are dissimilar to some extent from those used by State Highway Departments on Interstate highways. In addition, the existence of the toll charge is felt by many to disqualify toll roads for a study of this kind. Additional inquiry is necessary regarding both the possibility of using toll roads for measuring the effects of roads of the Interstate type and the availability and nature of toll road Commission records.

1958. Although the road had been in use for a short time only, the loss of land and the severance and barrier effects of the highway existed during the crop year of 1957 and since. Thus, this segment permitted the measurement of the effects of the highway over a 3-year period. As the last normal crop year was 1956, it was thought that farm operators probably would not have excessive difficulty in remembering the conditions that existed at that time. Further, ASC records were available for the year 1956 to provide some valuable acreage data and to serve as a check on information from farmer interviews.

Limitations of the Study

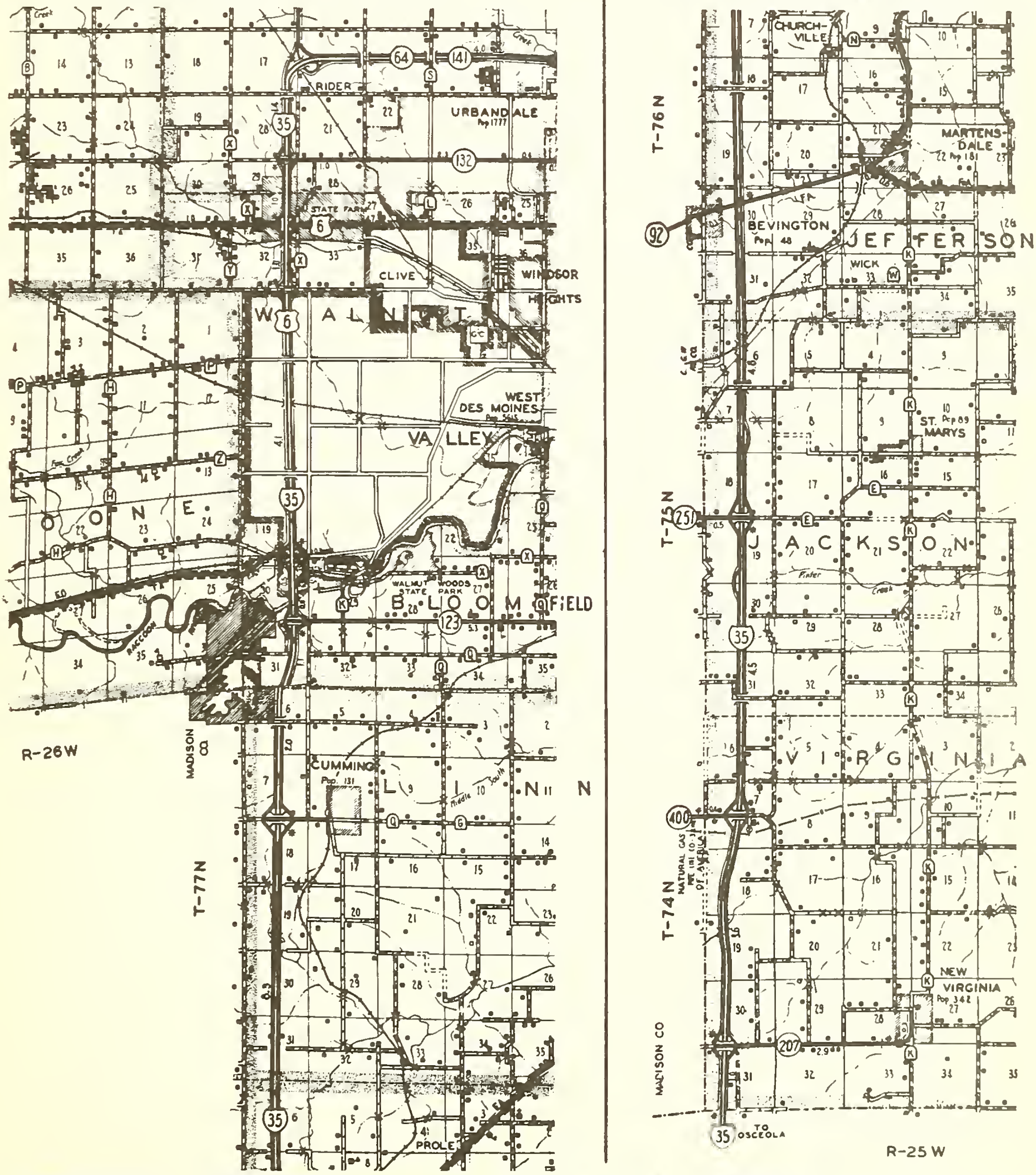
This study is limited to an analysis of some of the more general effects of an Interstate highway on farms in its path and to the development of a procedure for measuring these effects. Although it considers such items as farm resource use, enterprise variability, and use of segmented parcels within the group of farms concerned, the study is not a detailed farm management analysis. It does not attempt a precise measure of such things as time and number of miles involved in traveling within the farm and between the farm and markets. Neither does it attempt a measure of changes in field size and use, changes in costs of crop and livestock production, or changes in farm income. Although these factors are important, the detailed analysis required of each farm in order to obtain this information could not be undertaken within budget and time restrictions.

The main implication of this limitation is that the study is neither designed to assess, nor does it try to assess, the adequacy of the compensation paid by the Commission to the owners of farmland. Also, although some of the material presented is relevant to the calculation of severance damages, no attempt is made to judge the damage payments actually made. The omission of discussion of right-of-way and damage payments in the chapters that follow should not be interpreted to mean that farmers were inadequately paid for the disturbance and other losses they experienced. The major purpose of the study was to determine the kinds of changes brought to the area by the partial takings, and the kinds of adjustments farm operators made. This information may prove useful to appraisers in recognizing items of damage, but it is not sufficiently detailed to permit evaluation of the compensation paid. As a result of this orientation, the report may seem to emphasize the adverse consequences for farm operations of highway taking. But it should be remembered that landowners were paid by the Commission for their land and in most instances received compensation also for the resulting damage to their remaining property.

Figure 1

STUDY SEGMENT: INTERSTATE 35

Polk and Warren Counties, Iowa



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Another basic limitation with similar implications is that no attempt was made to measure the benefits derived by nearby farmers from use of the new highway. An evaluation of this kind would require the collection and interpretation of detailed origin and destination data. While such research was beyond the scope of the study reported, it is recognized that a more balanced picture of highway impact would be provided if some of the effects on travel patterns could be analyzed.

Scope of This Report

Background information about the agriculture of the area and the way in which the highway was constructed may be helpful in understanding why certain effects or problems occur. To provide this background, chapter 2 presents a general description of the area in which the highway is located, the general nature of the highway improvement, and the procedures used in planning the road. In chapter 3, the selection of farm operating units for the study including the control group of farms is described. Chapter 4 discusses briefly certain aspects of the taking procedure and details the immediate effect on farm acreage and farm buildings of rights-of-way and excess takings. Chapters 5, 6, and 7 present several changes occurring on those farms in the path of the highway and compare them with the changes occurring on similar farms located away from the roadway. The changes compared include those in number of farms, farm size, real estate transactions and prices paid for land, resource use, enterprise variability, and dispersion of land in operating units. In addition, farms losing land to the highway are analyzed in terms of the use and disposition of parcels of land separated from the farm headquarters. The final chapter examines and appraises the research techniques developed and tested in the study.

CHAPTER 2 - CHARACTERISTICS OF THE HIGHWAY AND THE STUDY AREA

The speed with which farm operators adjust their farm units to the loss of land occasioned by taking for highway rights-of-way and the nature of the adjustments they make depend on a variety of factors. Some of these factors, such as the age and tenure status of the operator, and his financial position and managerial abilities, are internal to the farm. Others are more general and affect all or most of the units located along the right-of-way. In this chapter, two of the most important general factors influencing adjustment patterns are discussed: The alignment of the highway, and the type of agriculture that prevails in the area through which it runs.

Location of the Highway

Route 35 is part of the National System of Interstate and Defense Highways authorized by the Federal Aid Highway Act of 1956. Iowa's segment of Interstate 35 will run north and south through the center of the State. When completed, it will bypass Des Moines, connecting that city with Kansas City to the south and Minneapolis-St. Paul to the north. At the time the study area was selected, approximately 46 miles of highway were open to traffic, and the 33-mile segment chosen for study had been in use for more than a year.

In planning the alignment of this segment of Interstate 35, location engineers considered four possible routes. 4/ Because the cost of raising the major existing north-south highway (U. S. 69) to Interstate design standards was considered to be prohibitive, this alternative was not considered competitive. Two of the four routes followed county roads already in existence. The other two were on new alignments and were located in such a way as to pass through the centers of the sections they crossed. 5/ These alternatives were selected after the topography of the area had been analyzed through field trips and a study of aerial photographs.

In choosing among these four alternative routes, location engineers considered factors such as rise and fall, cut and fill, and the need for bridges and culverts. In addition, the probable effect of the highway on drainage, farm severance, and local and area traffic were considered. For example, each major drainage area was delineated on aerial photographs to estimate the effect of the road on drainage patterns and the type of drainage structures needed. Farm ownership boundaries were located for the land through which each alternative route passed. The numbers of ownership tracts severed by each route were compared. Postal officials and school boards were consulted to determine mail

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4/ Most of this section is based on interviews with the Location Engineer, Iowa State Highway Commission, January 25 and 26, 1960.

5/ This type of alignment is sometimes referred to as following the one-fourth line or the interior property line.

and school routes. County boards and county engineers assisted in estimating cross traffic and in selecting interchange and overpass locations and roads to be closed.

The route chosen for Interstate 35 was one of the two on entirely new alignment; it is within one-half mile of the Madison-Warren County line. This was considered to be the most direct route for the traffic the highway was designed to serve. Origin and destination studies for the city of Des Moines and rural areas indicated that the major desire lines of travel to and from points south of Des Moines fell within a 2-mile corridor centered on the Madison-Warren County line. 6/

The route chosen passed through no small towns. This was not true of the two alternative routes which followed county roads. Because of its alignment through the centers of sections, fewer farm buildings were in the path of the highway than would have been the case with either of the two county road routes. The selected route also had engineering advantages with respect to stream and railroad crossings and the amount of cut and fill required. Although road-user benefit studies were not used in choosing among the alternative routes, they were later used to show the advantages of the route selected over existing highway facilities. 7/

It is clear that certain features of the alignment of this section of Interstate 35 operate to minimize the disruption of farm operating units. Probably the most significant of these is the north-south direction of the highway. Diagonal alignments at almost any angle would have resulted in more segmentation of farm units and thereby would have created greater adjustment difficulties. In addition, locating the highway on new right-of-way reduced the number of farm headquarters that had to be either moved or replaced, and probably resulted also in less interference with established travel patterns. Finally, alignment along the half-section line undoubtedly meant that fewer sets of buildings would fall on the right-of-way than if the section line had been chosen.

6/ A desire line is a line that connects the points of origin and destination of a trip.

7/ In this analysis, a comparison was made between the then existing highway facilities and the proposed highway between points of common termini. Passenger car and truck costs were computed for existing and proposed highways from Osceola to a point on the northern edge of Des Moines. In computing these costs, consideration was given to type of highway, types of vehicles using them, alignment, gradients, traffic volumes, running speed, and the resulting savings in time and operating costs for all traffic. The analysis indicated that the proposed highway would result in a $0.71 saving for each passenger car and a $2.13 saving for an average truck traveling between the two points. When the vehicular costs on the existing and the proposed highways were compared, the estimated saving on an annual basis for all vehicles was $1,996,800.

The major dimension of impact, therefore, was the swath of land removed from the group of farms lying in the path of the highway. The right-of-way for the highway alone required just under 40 acres of land per mile, and averaged 320 feet in width for most of the study segment. The additional acreage needed for intersections and crossings constituted a further demand for land along the route. A second group of effects stem from the existence and use of the completed freeway. For the farmers of the area, it serves both as a barrier to east-west movement and as an improved channel for north-south movement. 8/

Agriculture in the Study Area

Of the 33-mile study segment of Interstate 35, 24 miles lie along the western boundary of Warren County and 9 miles along the western edge of Polk County. Of the 80 farms chosen for inclusion in the taking group, 64 were in Warren County and 16 in Polk County. The 82 control farms are distributed similarly, except that the control area for the Polk County farms lies just across the county line in Dallas County. 9/ Warren County is in the south-central part of the State in the third tier of counties above the Missouri border. Polk and Dallas Counties lie one tier to the north, and the city of Des Moines is in Polk County.

Viewed in terms of such agricultural indicators as soil quality, topography, farm size, land values, and the yields of major crops, the study area is slightly below the State average. 10/ Each of these

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8/ In addition to the impacts on farm units resulting from the taking of land and the existence of the highway, certain aspects of the procedures used in highway planning and building and in the acquisition of right-of-way have important implications for the adjustments farm operators make. Although the analysis of the study is confined largely to the process of adjusting to the loss of land, references may be found in later chapters to some of the procedural questions that are relevant to the adjustment process, and the appendix explores particular aspects of acquisition policy and procedure.

9/ The rationale underlying the selection of both "taking" and "control" groups is presented in detail in chapter 3.

10/ Data on soil, topography, farm size and value, tenure of operator, enterprise combinations, and the like are drawn from the following publications: U. S. Department of Agriculture, Soil Survey of Polk County, Iowa, Washington, D. C., U. S. Govt. Print. Off., 1921. U. S. Department of Agriculture, Soil Survey of Warren County, Iowa, Washington, D. C., 1925. U. S. Bureau of the Census, United States Census of Agriculture, 1954, Vol. 1, Part 9, Iowa, Washington, D. C., U. S. Govt. Print. Off., 1956; and Iowa State Department of Agriculture, Iowa Book of Agriculture, 1956-57, State of Iowa, Des Moines, 1958.

In addition, data gathered in the course of the study are used when helpful in developing the descriptive material on the agriculture of the study area. References in the text make clear when generalizations are based on data collected in the study.

indicators also tends to fall off as one moves from north to south within the study area. At the northern terminus of our segment of highway (in southwestern Polk County), the dominant soil is the highly productive Carrington loam. This gives way to Tama silt loam as the Warren County line is approached. In western Warren County, the Tama silt is increasingly interspersed with the less productive Shelby loam. In the southwestern part of the county, it has given way completely to the Shelby soils. Small patches of Muscatine silt loam appear with frequency on ridges in the southern part of the county, and in the three river bottoms (North, Middle, and South), Wabash silt loam is the dominant soil.

Topographically, the study area becomes slightly rougher and less suited to cultivation as one moves from Polk County into Warren County. The level to gently rolling fields of the Polk-Dallas area turn into smoothly rounded hills with occasional eroded upland areas bordering the rivers of southern Warren County. Although the change is gradual, it is clear that the proportion of farmland that can be tilled is smaller in the southern than in the northern part of the study area.

The agriculture of south-central Iowa shows considerable diversification, but basically it is built upon a corn and hog economy. Increasingly, however, operators are supplementing hog production with a beef cattle enterprise, and there are many farms on which beef is the only livestock operation. Because most of the sample farms are located in Warren County and it is more typical of the area than either Polk or Dallas Counties, data for Warren County are used in the description that follows. The Census of Agriculture reported that in 1954, about 55 percent of the farm operators in Warren County were in the full owner tenure category, and about 25 percent were tenants who rented all the land they operated. Interviews with farm operators in the study group indicated that the most common leasing arrangement was the 50-50 crop share, for both entire farms and smaller parcels of tillable land.

In Warren County, in 1954, farms averaged 166 acres, slightly below the State average of 176 acres. Estimated values in the same year, on both a per farm ($23,900) and a per acre ($139) basis, were substantially below those of the State as a whole. The sample farms in Dallas and Polk Counties may be expected to be worth more than this average indicates, because of their superior soil and improvements, and because they are subject to the urban influence of Des Moines. While few farms in the study area were classed by the 1954 census as class I commercial farms (producing annually more than $25,000 of output), 3 of 4 farms qualified for class V or higher (output exceeding $1,200). The highest concentration was in class III (output between $5,000 and $9,999). While Polk and Dallas Counties show a somewhat heavier concentration in the higher classes of commercial farms, they also have more of what the census classifies as "other" farms, mainly part-time and residential farms.

Some 63 percent of the land in farms was classified as cropland in 1954, and virtually all farm operators report substantial acreages of woodland and permanent pasture in addition to tillable land. In

1954, the per acre yield of corn averaged 54.7 bushels compared with the State average of 62.1, and yields of oats and soybeans were 42.1 and 29.3 bushels per acre, respectively, both slightly above the Statewide average. Because of the relative roughness of the topography, tilled fields are frequently of odd shape and often are smaller than in more level areas of the State.

In the 1954 census, nearly half the farms in Warren County were classified as livestock farms, one-fifth as cash grain, and one-tenth as dairy farms. 11/ The rest fell into the general and miscellaneous categories. Among the 162 sample farms, 4 in 5 operators reported that they had sold fattened hogs in either 1956 or 1959 and 2 in 5 reported that they had marketed steers or heifers.

Virtually all farmers raise some corn. In the sample, only 3 of 162 farmers did not produce corn in either 1956 or 1959. Production of hay was almost as common among sample farms, with more than 95 percent of the operators reporting some land in hay. Soybeans were produced on more than 65 percent of the farms, and oats were raised on at least half the study farms. Although large quantities of corn have been placed under Commodity Credit Corporation seal in recent years, it is clear that most farmers in the area raise corn and feed it on the farm, with some farmers feeding more corn than they raise and others producing a surplus for sale.

While the 1954 census showed some 200 dairy farms in Warren County, this type of farm organization is undergoing rapid and basic change. As the area falls within the Des Moines milkshed, dairy farmers are under pressure to convert to the bulk-tank milk-handling system in order to qualify as class I producers. For most dairymen, this involves an expansion in herd size and an initial investment of upward of $5,000. From interviews with operators in the sample, it was clear that some dairy farmers were making the indicated upward adjustment, while others were moving out of dairying and into other types of farming or some type of nonfarm work.

An additional characteristic of the agriculture of the study area deserves comment. Proximity to industrial or commercial employment in Des Moines and its environs has resulted in many farm operators and members of their families holding off-farm jobs. According to the 1954 census, 1 in 4 operators in both Polk and Warren Counties worked off the farm more than 100 days during that year. The study reported here indicated that operators of nearly half the sample farms reported that some adult member of the household had off-farm work in 1959. Both the consequent reduction in labor available for farmwork and the availability of income from a nonfarm source influence farm operations and the pattern of adjustment to the right-of-way taking.

11/ Livestock farms are defined as those in which 50 percent or more of the value of farm products sold consisted of cattle, calves, hogs, sheep, goats, and so on, other than dairy animals. Cash grain farms are similarly defined, except that corn, sorghum, small grains, and so on, are the key products. Dairy farms are similarly specialized as to milk and other dairy products.

CHAPTER 3 - SELECTING FARM OPERATING UNITS

This chapter presents the procedures used in selecting farms for the taking and control groups. In addition, it indicates some of the difficulties encountered in establishing comparability between the two groups and the procedures used in tracing the farm units over time.

Having decided that two groups of farms would be used in measuring the highway effects, two tasks followed. One was to select the farm operating units for each of these groups. The other was to observe changes in the operations of the selected farms from 1956, the last crop year before highway construction, through the 1959 crop year. Because the procedures used in completing these tasks may be helpful in future highway research, they are presented here in some detail.

Selecting Farm Operating Units in Taking Group

This study was designed to measure highway effects on farm operating units, not on farm ownership tracts. An operating unit is defined to include all the land (and buildings) under the management control of a single individual, partnership, or possibly, corporation. The land and buildings may either be owned by the operator or rented by him from another owner. In acquiring rights-of-way, highway departments purchase from owners, and consequently, commission records provide information on owners and ownership tracts but not necessarily on operators and operating units. To learn what farm operating units were in the path of the highway, it was first necessary to find what ownership tracts were involved in right-of-way acquisition. Highway commission right-of-way plat maps showed the tracts involved, the names of the owners, and the way in which the highway crossed these tracts. Additional right-of-way records provided a legal description of each tract, its total acreage, and the acreage taken for the right-of-way. In some instances, records indicated whether the tract was operated by the owner or by a tenant. Although this information related only to ownership units, it helped in determining the operating units in which ownership tracts were used.

The County Agricultural Stabilization and Conservation Committee office maintains records on practically all farm operating units located in the county. In Warren, Polk, and Dallas Counties, these records were available for 1956, the last crop year before land was acquired for Route 35. With the name of the owner and the acreage and legal description of each ownership tract involved in right-of-way acquisition available, it was possible to determine from ASC records the 1956 farm operating unit in which the ownership tract was used. All such units that exceeded 10 acres in size and qualified as bona fide farm operating units were included in the taking group.

The operators of these 1956 units were interviewed to determine the changes in their operating units over time. In addition, when the 1959 and 1956 operators were different persons, both were interviewed to obtain a complete picture of farm operations during the 3 years. No effort was made to trace each ownership tract over time. However, facts were obtained from farm operators concerning the use and disposition of separated and land-locked parcels.

Selecting Farm Operating Units for Control Group

Procedures used in selecting farm operating units for the control group differed from those used in selecting farms for the taking group. As the function of the control group was to provide a measure of the changes in farms over time that would have occurred without the highway, the control farms had to meet several conditions. First, they had to be a sufficient distance from the Interstate highway to be clearly separated from farms in the taking group and to be outside the range of immediate influence of the highway. After considering such factors as dispersion of land tracts within a farm and real estate transfers by operators whose farms were in the path of the highway, a minimum distance of 3 miles was fixed upon.

As a second requirement, the control farms were to be comparable to the taking farms in 1956. Taking and control farms were to have similar soil, productivity, and farm operating characteristics. Further, these two groups of farms were to be within the same community and subject to the same nonhighway influences. That is, both groups of farms were to be from the same population. Unless the two groups of farms came from the same population, there would be no basis for assuming that changes exhibited by control farms during the study period would have occurred on the taking farms without the highway.

As an additional requirement, the control group was to be as homogeneous as the taking group, with both groups as homogeneous as possible. The greater the homogeneity within groups and the greater the comparability between the two groups, the greater is the likelihood of successful measurement of highway effects.

Selecting control area

Before specific control farms were selected, the general characteristics of farms on both sides of the highway segment were investigated. Soil Conservation Service technicians provided information concerning the topography, use, and productivity of land in the general area of the highway segment. Agricultural Stabilization and Conservation personnel provided information on farm size, farm enterprises, and tenure characteristics of farms in the area. In addition, field trips permitted observation of topography, land use, and enterprise characteristics of farms.

Information from these several sources indicated that the land was rougher and less productive toward the southern end of Route 35 in Warren County than toward the northern end in Polk County. The information indicated also that topography and productivity were fairly uniform in an east-west direction on either side of the highway. It was decided that a suitable group of control farms could be chosen from a north-south tier of sections 3 miles east of the Warren County segment of Route 35 and from a similar tier of sections 3 miles west of the Polk County segment. 12/

Hypothetical highway as a sampling device for control group

Farms for the control group were not chosen at random from available control sections. Rather, the sampling procedure used involved the use of a right-of-way for a hypothetical highway. A 1956 ownership plat map was obtained for the tiers of sections selected. A parallel hypothetical right-of-way 3 miles from Route 35 was drawn on the plat maps. Like the Interstate segment, this hypothetical road was drawn through the centers of the control sections. When the Interstate segment passed through ownership tracts on one side of the half-section line, the hypothetical road was drawn in the same way. When the Interstate road passed through ownership tracts on both sides of the center of the section, the hypothetical road was drawn in that way.13/

Farm operating units for the control group were chosen from the ownership tracts crossed by this hypothetical road. The ownership plat maps provided acreage, ownership, and legal descriptions of tracts crossed by the hypothetical road. These several facts were used in ascertaining from ASC records the 1956 operating units in which these ownership tracts were used, and inclusion in the sample depended on the criteria used for the taking group. These 1956 operating units became the control group, and their operations were traced for the 3-year period 1956-59.

In interviews with the 1956 operators of taking and control farms, enumerators determined whether the operator interviewed actually farmed the sampled ownership tract in 1956. Thus, the interview served as a final check on the procedures used for selecting the farms for analysis.

12/ The control area can be located on figure 1 by locating the tiers of sections the appropriate distance from Route 35.

13/ Note that this procedure has the advantage of keeping the clustering of ownership tracts and therefore operating units at the same points along the Interstate segment and the hypothetical road. As land seems to be more homogeneous from east to west than north and south along the highway, this clustering probably increased the comparability of the taking and control farms.

Comparability of Taking and Control Groups of Farms

After reviewing procedures used in choosing the two groups of farms, one may ask how effective they were in establishing comparability. A comparison of a few factors, such as average farm size, average tillable acres, tenure, and age of operator, should serve to indicate the degree of comparability (table 1).

Table 1.- Comparison of taking group and control group farms: Selected characteristics, crop year 1956

Item compared	Unit	Taking-group farms	Control-group farms
Average size of all farms---------	Acres	278.0	224.5
Average size of farm operated by -			
Owners------------------------	do.	207.6	185.3
Part owners-------------------	do.	405.5	272.4
Tenants-----------------------	do.	309.9	271.8
Average acreage of tillable land--	do.	174.4	152.6
Percentage distribution of operators:			
Owners------------------------	Percent	48.8	54.9
Part owners-------------------	do.	18.7	30.5
Full tenants------------------	do.	32.5	14.6
Average age of operators---------	Years	48.9	46.4

Based on simple averages, farms in the taking group were 23.8 percent larger than farms in the control group. 14/ A breakdown of each group by tenure showed that owner-operated, part-owner, and tenant farms in the taking group were also larger than their counterparts in the control group. The owner-operated farms were 12.1 percent larger and the tenant-operated farms were 14.0 percent larger. However, the greatest difference occurred between farms operated by part owners. The average size of part-owner farms in the taking group was 48.9 percent larger than the average of those in the control group. Although it is reasonable to expect greater differences in subgroup than in group averages, a difference as large as that found between the two subgroups of part-owner farms was unexpected.

14/ The average size of farms in both taking and control groups is considerably larger than the average for all farms in their respective counties. This unrepresentativeness can be expected, however, in view of the minimum size set for inclusion in the study and also because the sampling technique used is more likely than a purely random method to pick up the larger farms.

The control and taking groups of farms were more similar as to acreage of tillable land than as to total acres per farm. Although the taking farms were 23.8 percent larger, they had only 14.3 percent more tillable land than control farms.

The tenure characteristics in the two groups showed both similarities and differences. The percentages of owner-operated farms in the two groups were similar, with 48.8 percent in the taking group and 54.9 percent in the control group. However, differences in the percentages of part-owner and tenant farms were evident. Of the taking-group farms, 18.7 percent were part owners and 32.5 percent were tenants. In contrast, the control group showed an inverse relationship, with 30.5 percent part-owner farms and 14.6 percent tenant farms. The average age of operators was measured as a final indicator of comparability. Operators in the taking group averaged 48.9 years of age and those in the control group 46.4 years.

Despite the differences in size and tenure pattern, the two groups were sufficiently similar in other respects to provide a meaningful comparison.

Farm Changes Over Time

Two aspects of the procedure used in tracing farm units over time should be emphasized. The first is that the unit of observation is the farm operation rather than the operator. As a corollary to this, the second is that when a farm unit goes out of existence, no further information is collected on the land, buildings, or operator involved.

For purposes of the study, the farm operating unit was considered to be any acreage exceeding 10 acres farmed by its operator as a unit. 15/ Most of the units included in the two samples had farm buildings including the operator's residence. Therefore, the task of tracing the farm over time became one of observing the relationship between the use of the farm buildings and the land they serviced. As a general rule, a farm operating unit was identified and its continuity traced through the farm buildings. If the set of buildings identified as the headquarters of the 1956 unit was still the headquarters of a bona fide operating unit in 1959, the 1956 unit was considered to be still in existence in 1959. Frequently, of course, a different operator occupied the buildings and managed the unit, and even more frequently, some land had been dropped from or added to the unit since 1956. But if the farm buildings had disappeared or had ceased to serve as the headquarters of a farm operation, the operating unit was considered to have gone out of existence.

15/ Because of the acreage required for field crops and hog and beef enterprises on farms in the study area, only 5 in the control group and 5 in the taking group contained less than 80 acres.

Several examples will illustrate the use of this general rule. Let us assume that an ownership tract was traced to a 1956 operating unit comprising 160 acres and a farmstead. In 1956, this unit was operated by A. Therefore, A was interviewed concerning the 1956 characteristics of the farm operating unit. If he remained on the farm and operated the 160 acres in 1959, he was also interviewed concerning the 1959 characteristics of the farm. Also, if he added or dropped some land between 1956 and 1959, this change was noted during the interview concerning the 1959 characteristics of his farm. In those instances in which land was dropped from a unit, enumerators made no effort to determine either the 1959 use or the 1959 user of the acreage dropped.

If, instead of operating the unit until 1959, A retired, moved to town, and either sold or rented his land and buildings to B, then B was interviewed concerning the 1959 characteristics of the farm operating unit. This was done even though B operated additional land elsewhere.

As another possibility, assume that the 160 acres operated by A is in the path of the highway. In 1957, he sold 40 acres to the Highway Commission for right-of-way and 100 acres across the highway from his farmstead to B. Assume that A remained in his buildings and operated the remaining 20 acres, and by 1959 acquired through rental or purchase 150 acres elsewhere. Despite the fact that he had little left of the land that composed his 1956 farm unit, A was interviewed concerning the 1959 conditions of the farm unit.

To illustrate the disappearance of a farm operating unit, assume again that in 1956, A occupied the farm buildings that serviced the 160 acres he operated. Assume also that C operates a 200-acre farm nearby. If A rented or sold his land to C before 1959, even though A retained the use of the farmstead, the farm unit ceased to exist. Assume instead that the 160-acre unit operated by A is in the path of the highway. In 1957, he sold 40 acres of right-of-way, including his buildings, to the Commission. In 1958, he sold 20 acres to C and rented out 100 acres to D. Both C and D operated additional land served by farmsteads. Thus, through right-of-way acquisition, sale,and rental, the farm unit disappeared. In this and other instances in which a unit had ceased to exist, no effort was made to trace the 1959 use of the land.

CHAPTER 4 - THE RIGHT-OF-WAY TAKING

The nature and degree of the impact of right-of-way taking on farm operations depend on two major factors. The first is the actual alignment of the highway. This involves such considerations as location of the highway in relation to section lines, other roads, farm boundary lines, towns or urban areas, and the like. In planning the alignment, much can be done to keep adverse impacts from these location decisions to a minimum. Relative costs of rights-of-way for alternative alignments are indicators of the degree to which farms will be affected.

Once plans for the location of the highway are definite, certain lands and buildings will fall within the required right-of-way and thus will be acquired by the highway agency. At this point, the second major determinant of farm impact comes into play--the degree to which the highway agency buys, sells, and trades land and buildings. The highway department may limit its land acquisition to the minimum amount required for the highway. Alternatively, in addition to rights-of-way, it may buy parcels of additional land that may be separated from the farm headquarters by the highway. As a third possibility, entire ownership units in the path of the highway may be purchased, if both owners and highway agency find this to be advantageous. When excess land and buildings are purchased, a simple and rapid procedure for selling the excess acreage may greatly speed the adjustments made by farmers who seek to replace acreage lost to rights-of-way. The policies and procedures followed influence directly the size and efficiency of the farms affected.

This chapter sets forth certain Commission procedures and policies used in acquiring land and buildings for Interstate Route 35. In addition, it shows the immediate effects of these procedures on farms in the path of the highway. Particular attention is given to the number of farmsteads disrupted and the amount of land required by the route as aligned through the centers of sections. It summarizes also the immediate reduction in farm size that resulted from the Commission's land-acquisition policies.

Acquisition Procedures in Iowa

The Iowa Highway Commission is authorized to buy and sell land in addition to that needed for rights-of-way. This authority existed before land was acquired for Route 35. Under this authority, the Commission can acquire an entire lot, block, or tract of land, if, by so doing, the interests of the public will be best served, even though the entire parcel of land is not needed immediately for right-of-way purposes. 16/ Further, the Commission may sell any tract of land that is not or will

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16/ Code of Iowa, 1958, Chapter 306A.5.

not be used for highway purposes. 17/ The Commission has authority also to rent out property that has been acquired for any highway improvement, but is not immediately needed for such improvement. 18/

Using the authority to purchase excess land, negotiators for Route 35 bought some separated and landlocked remnants that resulted from the right-of-way taking. In a few instances, rather substantial portions of farms were acquired in this way. Most of these excess parcels that were purchased were bought along with the right-of-way. Purchases involving excess land were voluntary transactions between the Commission and the property owners, and in each instance, the amount offered by the Commission for the excess land was based on Commission appraisal of the property.

Having acquired this excess property, the Commission sold or rented most of these parcels to other farmers, some of whom were operators who had lost land and wished to reorganize their operating units. The transactions occurred both during the period in which land was acquired and later. Property owners adjacent to the excess land were given first opportunity to buy or rent the land. In one instance, a series of purchases and sales of excess land by the Commission was conducted among five farms all losing land to the highway. These particular transactions led to the reorganization of four of the units and the voluntary sale and reapportionment of the fifth. Another result was a saving of more than $9,000 to the Highway Commission. The details of these transactions and the physical effects on farm size are appended to this chapter as a case study.

One other aspect of taking procedure should be noted. Under certain conditions, owners are permitted to keep and move buildings and other improvements situated on the right-of-way. If the appraised cost of moving the improvement is less than its appraised value, and if the property owner accepts the Commission's offer, he is paid for moving the improvement and thereby retains title to it.

Impact on Farm Buildings

As noted earlier, if Interstate 35 had been constructed on an existing county road instead of on new alignment through the centers of sections, many farmsteads would have been disrupted. A comparison of farms in the path of the present alignment with those in the path of an alternative route following a county road will illustrate this point.

17/ Code of Iowa, 1958, Chapter 306.16.

18/ By Act of the 58th General Assembly to be included in Code of Iowa, Chapter 306.

A review of Highway Commission, county, and planning maps indicated that there were 33 farmsteads along an 11.5-mile segment of a county road which constituted a part of an alternative route. Eighteen of these farmsteads were on one side of the county road and 15 were on the other side. Assuming that the highway would be built to one side or the other of the county road, it is likely that at least 15 of the farmsteads adjacent to the road would have been disrupted. 19/ This would amount to about 8 farmsteads disrupted for each 6 miles of county road followed. In contrast, the existing route of Interstate 35 disrupted only six farmsteads throughout its 33-mile length. This is one farmstead for each 5½ miles.

Six farm operators had farm buildings in the path of Route 35. Four of them faced the possibility of losing all or most of their buildings. A fifth faced the possible loss of one of two sets of farm buildings he rented. The sixth had one building and a well situated in the path of the highway. In each instance, if the appraised cost of moving the building were less than the appraised value of the building, the Commission could allow the building to be moved from the right-of-way. Some owner-operators took advantage of this policy.

Of the four operators who faced the prospect of losing all or most of their buildings, two moved part of their buildings from the roadbed and sold the rest to the Commission. In turn, they constructed additional buildings on their land to replace those acquired by the Commission. The other two operators lost the buildings on their units. One, an owner-operator, sold his buildings to the Commission and retired. The other was a tenant. His landlord sold the entire set of buildings to the Commission and constructed a new set of farm buildings back from the right-of-way for the tenant's use.

The remaining two operators sold some but not all of their buildings to the Commission. One of them retired. The other has operated his unit without replacing the buildings he lost.

Although the number of farmers losing buildings is small, one conclusion seems warranted. It is that the policy of the acquiring agency in allowing farmers to move their buildings from the right-of-way helped the farm operators to adjust their units.

Farmland Acquired

The previous section indicated that alignment of the highway through the centers of sections caused fewer farmsteads to be disrupted than would have been true if the highway had been constructed on a county

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19/ If the highway were constructed in such a way that it crossed over from one side of the county road to the other, the number of farmsteads damaged might be smaller.

road. It is more difficult to compare the amount of land that would be lost by these two types of alignment. At first glance, it may seem that construction of an Interstate highway on a county road would require less farmland than would construction of a highway through the centers of sections. This may or may not be true.

As a general rule, when an Interstate highway is placed through the centers of sections in rural areas, service roads are not constructed. When the highway is placed on an existing road or street, service roads frequently are necessary to maintain access of abutting property owners to the system of public roads. Thus, the amount of farmland that must be acquired for a highway constructed on a county road may be as great or greater than that required for a highway constructed along the half-section line. Highway Commission plans for alternative routes of Interstate 35 were not sufficiently detailed to indicate the land needs for each of the alternative alignments. An interesting comparison, however, is offered by the land requirements of a segment of Interstate 94 constructed along a previously existing road in Kenosha County, Wis. 20/

This 12-mile segment utilized the roadbed and right-of-way of State Trunk Highway 41, running between Chicago and Milwaukee. Route 41 was a four-lane divided highway, and the new Interstate route was so aligned as to use one or the other of the dual lane strips as a service road for abutting property owners. Despite the wide right-of-way inherited from Route 41, construction of this segment of the Interstate highway required approximately 40 additional acres per mile of highway. This figure approaches the 55 acres per mile actually acquired for right-of-way for the study segment of Interstate 35. Had Route 35 been constructed on an existing county road, probably the right-of-way requirements would have exceeded considerably those for Wisconsin 94, particularly in view of the narrower strip of roadbed the Iowa county road would have provided. 21/ Whether land requirements would have differed much from those for the chosen alignment is doubtful.

Effect of land acquisition on farm size

The Highway Commission followed the policy of purchasing separated and landlocked parcels from property owners who wished to sell them. Most of these purchases occurred at the time the Commission was acquiring the right-of-way. Therefore, the purchase of both right-of-way and excess land must be considered in measuring the immediate effects of highway land acquisition on farm size.

20/ For additional information on Wisconsin Interstate 94, see The Economic Impact of Highway Improvement, op. cit., pp. 85-97.

21/ The frequency of interchanges is only slightly greater for the segment of Interstate 94 than for Interstate 35. This condition would reduce the amount of land needed for interchanges, but probably it would not be great enough to offset the extra land that would be needed for Interstate 35 because of the narrower public right-of-way provided by the county road.

Some of the excess parcels were sold or rented to owners and operators who had lost land and wished to adjust their farm units. Others were sold or rented to operators who did not lose land to the highway. Although many of these transactions occurred months after the right-of-way was acquired, a few parcels were sold by the Commission during the acquisition phase. For instance, several parcels of land purchased by the Commission were deeded to other landowners as part payment for the right-of-way purchased from them.

In presenting the immediate effects of land acquisition on farm size, two effects are distinguished. First is the reduction in farm size that would have occurred if the Commission had acquired only the strip of land needed for the highway. The other is the actual change in farm size resulting from the Commission's purchase of right-of-way and excess land and its sale of land at the time of acquisition.

Land acquisition for Route 35 resulted in an immediate reduction in farm size that averaged 28.7 acres per farm for those units in its path (table 2). This amounted to an average decrease in farm size of 10.3 percent for the 80 farms crossed by the highway (table 3). A little more than half of this reduction in size resulted from the acquisition of rights-of-way, while slightly less than half resulted from the purchase of excess land. Acquisition of right-of-way alone accounted for a 6.8 percent decrease in farm size, while the purchase and sale of excess land raised the average decrease in farm size to 10.3 percent. Thus, land acquisition by the Highway Commission had the immediate effect of reducing farm size in the taking group by a little more than a tenth.

The immediate decrease in farm size would have been about three-fifths as great if land acquisition had been restricted to needed rights-of-way. However, if land purchases had been limited to acquisition of rights-of-way, property owners would have been denied the opportunity to sell isolated and landlocked parcels to the highway agency. Such a policy would require the owners of these parcels to bear the risk of selling them to the one or the few who could use them. By comparison, the policy undertaking the purchase and sale of excess land allows the farmer to transfer to the Commission both the ownership and the risk of disposing of these parcels.

This chapter has shown that the land-acquisition policy of the Commission had the immediate effect of decreasing by about a tenth the size of farms located in the path of the highway. The next step is to determine the nature of the adjustment farmers made to the decrease in size of units. The following chapter indicates some of the changes or adjustments in farm operating units over time. It also suggests some of the effects of the Commission's purchase and resale of excess land on these adjustments.

Table 2.- Change in size of farms as result of right-of-way transactions

Change in size (acres)	Farms reporting change resulting from -	
	Purchase of right-of-way	Purchase of right-of-way and excess land 1/
	Number	Number
Increase:		
More than 10	xxx	2
0 to 10	xxx	0
Decrease:		
0 to 4	8	8
5 to 9	19	12
10 to 19	19	19
20 to 29	18	12
30 to 49	11	12
50 to 100	4	11
100 or more	1	4
Total 2/	80	80
Average acres lost	18.9	28.7

1/ This is net excess as explained in text. Since the Highway Commission purchased extra land from the landowner and could also sell the landowner other land it had acquired, the size of the operating unit may be greater after land acquisition than before acquisition.

2/ Number of farms in existence at time of right-of-way taking.

Table 3.- Percentage change in size of farms as a result of right-of-way transactions

Change in size (percent)	Farms by percentage change resulting from -	
	Purchase of right-of-way	Purchase of right-of-way and excess land 1/
	Number	Number
Percentage increase:		
More than 10	xxx	2
0 to 10	xxx	0
Percentage decrease:		
0 to 4	28	24
5 to 9	28	19
10 to 14	14	16
15 to 19	3	5
20 to 29	5	4
30 to 49	2	5
50 or more	0	5
Total 2/	80	80
	Percent	Percent
Average decrease in size of farms 3/	6.8	10.3

1/ See footnote 1, table 2.
2/ Number of farms in existence at time of right-of-way taking.
3/ Computed by dividing total acres lost by total acres in farms.

Case Study of Excess Land Purchase and Disposition: Polk County Interchange

The authority to purchase and later sell or lease land and buildings in excess of requirements for rights-of-way was frequently exercised by the Iowa Commission in acquiring land for Interstate 35. In general, it can be said that prudent exercise of this power facilitates the needed reorganization of farm operations, and removes from the landowner and the local land market much of the risk associated with disposition of separated parcels.

A particularly dramatic series of transactions in which the Commission acquired and then disposed of excess land occurred in Polk County, as part of the acquisition of land for a major Route 35 interchange west of Des Moines. The transactions were so closely interrelated that for all practical purposes, they were made simultaneously. Five landowners were involved, and more than 500 acres of land worth nearly $200,000 changed hands. One result was a saving to the Commission of more than $9,000 over original estimates of cost. Perhaps more important was the reestablishment of four ownership tracts as viable farm operating units.

Figure 2 indicates the boundaries of the ownership units as they existed before rights-of-way were acquired. The broken line outlines the area the Commission had determined to be the minimum acreage needed for the right-of-way. This boundary, along with the location of the highway and the interchange are drawn on figure 2 to indicate the decisions facing both the Commission and the farmers of the area. Owner A, who operated the entire shaded acreage, was faced with the loss of nearly a third of his unit because of the substantial area needed for a cloverleaf of the type indicated. In addition, his buildings, which were in the northeast corner of the farm, would be isolated from most of the remaining acreage. Immediately to the north, the tract belonging to C was scheduled to be segmented, with the parcel to the west of the highway left landlocked and accessible only through the property of either D or E. 22/

The operating unit belonging to B would have been similarly affected. In 1956, the farm was operated in entirety by a tenant; it would have been segmented by the taking, and the portion west of the highway would have been inaccessible to the operator, who occupied a set of buildings on the east side. Had the Commission not been able to arrange the series of exchanges it did, construction of an access road through D's land, parallel to Route 35, would have been necessary to permit B's tenant to get to the separated tract.

22/ In 1956, C's land was rented out and operated by still another farmer not involved in this series of transactions. C, who held a full-time off-farm job, occupied the buildings. Since the time of the taking, C has ceased renting and now operates his altered acreage as a part-time farm.

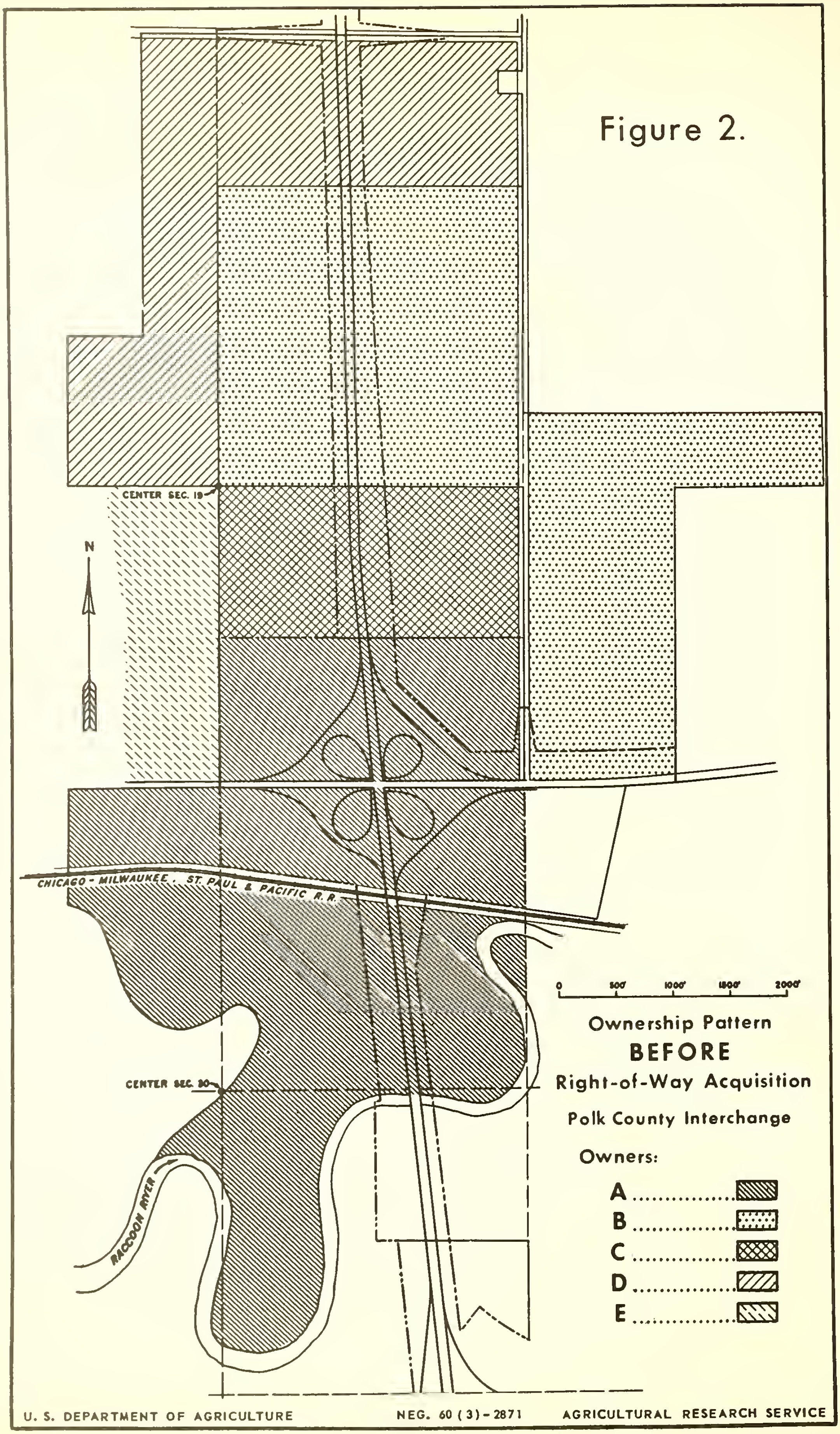


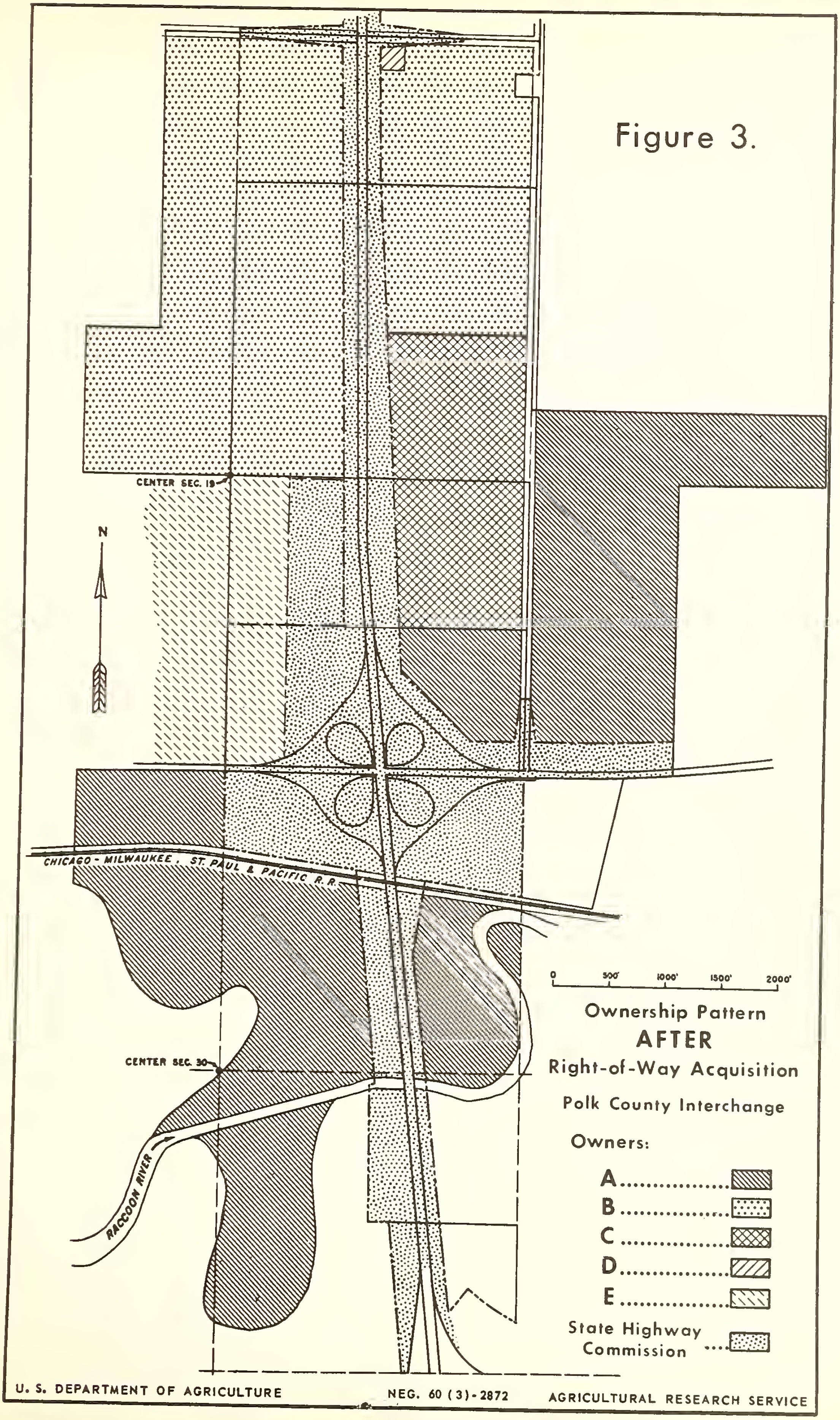
Figure 2.

Ownership Pattern
BEFORE
Right-of-Way Acquisition

Polk County Interchange

CENTER SEC. 19
N
CHICAGO - MILWAUKEE, ST. PAUL & PACIFIC R.R.
CENTER SEC. 30
RACCOON RIVER
0
500'
1000'
1500'
2000'
Owners:
A ▨
B ▨
C ▨
D ▨
E ▨
U. S. DEPARTMENT OF AGRICULTURE
NEG. 60 (3) - 2871
AGRICULTURAL RESEARCH SERVICE

Figure 3.


CENTER SEC. 19
N
CHICAGO - MILWAUKEE, ST. PAUL & PACIFIC R.R.
CENTER SEC. 30
RACCOON RIVER
0
500'
1000'
1500'
2000'
Ownership Pattern
AFTER
Right-of-Way Acquisition
Polk County Interchange
Owners:
A .... ▨
B .... ░
C .... ▩
D .... ▨
E .... ▧
State Highway Commission .... ░
U. S. DEPARTMENT OF AGRICULTURE
NEG. 60 (3)-2872
AGRICULTURAL RESEARCH SERVICE

In 1956, D's land also was rented out and operated along with substantial additional acreage by a tenant who occupied the buildings on the road running along the north edge of the farm. While D's property would not have been faced with the accessibility problems encountered by other owners, the land would have been badly segmented and certain operating difficulties would have been introduced.

Faced with the prospect of paying heavy severance damages, as well as pacifying several farm owners and operators, the Commission used to the full its power to buy and sell excess land. By first buying from one owner, then selling to another, and finally canceling out the gains of each party against his losses and paying the difference in cash, the Commission engineered a series of exchanges that left the ownership pattern of the area unrecognizable.

A, who stood to lose the largest acreage, transferred to the Commission some 116 acres, most of which was needed for the building of the interchange structures. He was compensated, however, with approximately 110 acres previously belonging to B, but close enough to A to be farmed conveniently by him (fig. 3). 23/

B also figured in the Commission's dealings with C. The latter agreed to transfer to the Commission his landlocked parcel west of the highway in return for a similar 38-acre tract bordering the north edge of his remaining property. The Commission had purchased this parcel from B, along with the land deeded to A.

All of these transactions greatly reduced the acreage left to B and pretty well destroyed his operating unit. But the Commission was able to reimburse him in kind through the willingness of D to sell outright the entire tract shown in figure 2. 24/ All of this tract except the 11 acres required for right-of-way was transferred to B, bringing his acreage back to within 33 acres of what it had been originally. The final transactions in this series were between the Highway Commission and E. E gave up $6\frac{1}{2}$ acres for the right-of-way but received from the Commission nearly 30 acres of excess land west of the highway, which had been purchased from A and C. Figure 3 maps the ownership pattern as it emerged from this series of transactions, and table 4 provides a detailed breakdown of the acreage changes undergone by each ownership unit.

23/ In addition to the transfers of land, A's relations with the Commission were complicated by two other transactions: (1) The Commission agreed to build a cattle pass from his buildings to his pasture on the other side of the county road. (2) Because the shift in the channel of the Raccoon River (changed to provide better drainage for Interstate 35) landlocked some 20 acres of his land, he was compensated for the resulting severance damages.

24/ One feature of this transaction is of particular interest to agricultural economists. The operator who was renting D's land held it under a 5-year written lease. This gave him a substantial financial and legal interest in the property, and when it was sold, the Commission had to negotiate with him for the unexpired balance of his interest. The upshot was a sizable cash payment to the tenant as well as to the landlord.

The success of this procedure in easing the adjustment of operating units and assuring their continuity cannot be questioned. At the same time, it is clear that negotiating such a series of trades can be time-consuming for the Commission. The risk and expense of holding excess land also can be burdensome to the highway agency. A further consideration is the elaborate documentation needed to justify the Commission's becoming so deeply involved in the land market. All of these factors operate to discourage the Commission from entering into negotiations of this kind and may preclude a second series of transactions of this complexity.

Table 4.- Polk County land trades: Summary of acreage changes

Owner	Size of ownership unit before acquisition	Sold for right-of-way	Sold in excess	Received from Highway Commission	Size of ownership unit after acquisition
	Acres	Acres	Acres	Acres	Acres
A-------	324	91	25	110	318
B-------	280	33	148	148	247
C-------	80	14.5	29	38	74.5
D-------	159	11	148	0	0
E-------	80	6.5	0	29	102.5

CHAPTER 5 - IMPACT ON NUMBER, TENURE, AND SIZE OF FARMS

The taking of land and buildings can be expected to have an immediate and perhaps a long-run impact on the farm operating units directly affected. In chapter 4, certain aspects of acquisition policy were reviewed and the requirements for rights-of-way were summarized in terms of buildings and acres of land taken. In this and later chapters, the reaction of farm operators to the right-of-way taking is traced by describing the ways in which they have adjusted to it. Some information on patterns of adjustment is derived directly from operators' statements explaining the changes made, but reliance was mainly on inferences drawn from comparisons made between units in the taking group and those in the control group. Topics covered in this chapter include the rate of disappearance of operating units, the turnover of farm operators, farm tenure patterns, changes in farm real estate, prices of farmland bought and sold, and the acreage of farm operating units.

These topics and those covered in succeeding chapters were included because they seemed to be features of a farming community that would be affected by an Interstate right-of-way taking. The data-collecting procedure was designed to provide information that would indicate whether or not the changes expected actually occurred. Before turning to the empirical findings, let us consider the following expectations - or hypotheses - as to the impact of the highway taking on the farms affected.

Because rights-of-way can take a substantial portion of the total farm acreage, the taking farms were expected to show a higher rate of disappearance than the control farms. This expectation was reinforced by the knowledge that a number of farmsteads would lie in the right-of-way. The building of the highway could also be expected to speed up the process of consolidation and farm enlargement that is found in most agricultural areas of the country. It would make land available for expansion of nearby farms by segmenting the land of some farm units and perhaps also by taking the buildings.

The rate of turnover of farm operators - the second characteristic studied - was expected to be higher in the taking than in the control group. Changes in farm acreage or layout resulting from the partial taking were viewed as inducements for farm operators to sell out and for tenants to seek new rental units. Although some turnover of operators is a feature of all farming areas, it was believed that one impact of the highway would be to increase this rate.

Expectations as to tenure pattern changes were less clear-cut. It was expected, however, that one general response to the impact of the highway might well be a substantial change in the distribution of units among the three major tenure classes. Expected particularly was a rapid rate of growth in the part-owner category, as owners who sold land to the Commission tried to replace their lost acreage through rental of parcels near their headquarters.

Similar reasoning supports the expectations in a fourth area - the frequency of real estate transactions. Farmers in the taking group who were facing a shortage of land or left with separated parcels, would be more likely than those in the control group to buy, sell, rent in, or rent out land and buildings. The number of transactions to which taking-group farmers were a party was therefore expected to be greater than the number of control-group transactions.

The fifth hypothesis - that sales prices for comparable land would be higher for transactions of taking-group farms than for those of control-group farms - is related to the level of real estate activity. Both the expected high level of buying and selling and the possibilities that the highway would bring nonfarm demands for land support this expectation.

The final characteristic considered was the average size of farms in the two groups. By definition, all farm units in the taking group lost some land to the highway. The property owner, of course, was compensated both for the acreage taken and for the damage done to the rest of his unit. Both the loss of the land and the compensation received may be strong inducements to farm operators to expand their acreage. Therefore, taking-group farms were expected to tend to recoup the lost acreage. 25/ This would result in a more rapid rate of growth for taking farms from the time of acquisition than for control farms. The possible long-run impact of the highway on farm size offers an interesting subject for speculation. On the one hand, it could be argued that a highway alignment which takes proportionately more land than buildings might slow down the general tendency toward farm expansion. On the other, a particularly heavy taking of buildings might release land in such a way that the growth in farm size would be accelerated. Sufficient time had not elapsed since the taking to provide a satisfactory test of either of these hypotheses.

We turn now to consideration of the collected data that is relevant to testing the hypotheses presented. The changes in these several characteristics for farms in the path of the highway - the taking group - are compared with changes in the same characteristics for farms 3 miles from the highway - the control group. If there was little or no difference in the change exhibited by the two groups, the conclusion drawn was that the highway had no effect on the characteristic measured. However, if there was a sizable difference in the change exhibited by the two groups for a particular characteristic, an attempt was made to determine the probable relation of the highway to the difference between the two groups.

25/ It should be emphasized that this expectation applies with greatest force to the owner-operator, as it is he who has both the cash and the incentive to expand acreage. Tenants may wish to expand their operations, but they may not be in as good financial position to do so as the owner-operator.

Disappearance of Operating Units

During the period from 1956 to 1959, 11 farms crossed by the 33-mile segment of highway went out of existence (table 5). This was approximately a 14-percent decrease in the number of farms in the taking group during the short span of 3 years. However, the entire decrease cannot be attributed to highway land acquisition and highway construction.

Table 5.- Number of operating units, taking and control groups, 1956 and 1959

Farm group	Farm operating units		Percentage decrease
	1956	1959	
	Number	Number	Percent
Taking -------------	80	69	13.8
Control ------------	82	77	6.1

A decrease in the number of farm operating units has occurred in many agricultural areas. This change occurred in the general farm area through which the highway is located and can be seen in the change in farm numbers shown by the control group. Between 1956 and 1959, five control farms went out of existence. As the control-group farms were away from the highway, it is reasonable to assume that the highway was not the cause of their disappearance.

A comparison of the two groups indicates that the decrease in number and percentage of farm operating units was twice as great in the taking as in the control group. Therefore, there seems little doubt that the highway increased the rate of farm disappearance. A review of the nature of farms going out of existence indicates how the highway may have influenced the rate of disappearance.

The farms in the path of the highway that disappeared possessed one or two distinguishing characteristics. A majority of these farm units were operated by persons nearing retirement. Apparently, the Commission's acquisition of land and the construction of the highway were sufficient to induce these operators to cease farming. The second distinguishing characteristic was the serious interference with farm operations by the way in which the highway crossed the property. Either the destruction of buildings or the nature of farm segmentation made the farm undesirable in the eyes of its operator. These two major characteristics occurred together on several of the farms that went out of existence.

The advanced age of the operator was the most evident characteristic shown by farms that disappeared. Operators of units that went out of existence had an average age of 55 years, 26/ about 7 more than the average of operators of units that remained in existence (table 6). In addition, units that went out of existence were generally smaller than units that remained. This fact is consistent with the findings on age. Typically, as farmers approach retirement, they expand their farm operations less than other farmers in the area. Some operators approaching retirement reduce the size of their units. Thus, a size differential can be expected between those farms whose operators are approaching retirement and the remaining farms. Table 6 indicates that the 11 farms that went out of existence average 30 percent fewer acres than those units that remained in existence

Table 6.- Comparison between taking group farms going out of existence and other taking group farms

Item	Unit	Farms	
		Going out of existence	Remaining in 1959
Total number of farms	Number	11	69
Average size of farm before highway construction	Acres	203.6	290.0
Average acreage of land used for:			
Right-of-way	do.	15.7	19.4
Right-of-way and excess	do.	48.2	25.5
Percentage of land used for:			
Right-of-way	Percent	7.7	6.7
Right-of-way and net excess	do.	23.7	8.8
Average age of operator	Years	55.3	48.0

	Number	Number	Percent
Farms:			
Losing buildings	2	4	5.8
With land segmented	5	35	43.8
With landlocked parcels	2	14	20.3
Operated by:			
Owners	7	32	46.4
Part owners	2	13	18.8
Tenants	2	24	34.8

26/ One operator was 26 years old. Without this operator, the average age of the group would have been 58.2, a full 10 years more than the average age of operators on the units that remained in existence.

Serious interference with farm operations by the highway is the second major characteristic shown by the units that disappeared. The degree of interference depends upon the way in which the highway crossed the farm. Farm disappearance cannot be linked neatly to amount of right-of-way required, existence of segmentation, or landlocking of a parcel.

For example, the farms that went out of existence did not lose more land to the right-of-way than those that remained in existence. Those that disappeared were required to give up an average of 15.7 acres, or 7.7 percent, of their land for right-of-way while those that remained gave up an average of 19.4 acres, or 6.7 percent, of their land. It is also clear from table 6 that the farms that disappeared fared about as well as other farms in terms of segmentation and landlocking of parcels.

Serious interference with farm operations generally constitutes something more than just the existence of severance or the landlocking of a parcel. For the farms that went out of existence, this interference took several forms. The destruction of the farmstead or of major improvements was one form. A second form was the severance of a substantial portion of the farm from the headquarters. The third form was the landlocking of a substantial part of the farm. The concept of interference is somewhat subjective. What constitutes substantial interference with farm operations for a farmer approaching retirement may be of little consequence to a younger operator. A brief description of the circumstances surrounding a few cases of farm disappearance will show the linkage between age of the operator or interference with farm operations by the highway and the rate of farm disappearance.

Four of the 11 farms that went out of existence are described here. These four demonstrate ways in which the highway can increase the number of farms going out of existence. Several of the other cases of disappearance are similar to one or the other of these examples.

Farm No. 36 was operated by a 66-year old operator in 1956. The unit had 230 acres of land, most of which was tillable. The highway right-of-way took 4 acres of land but none of the buildings. However, the highway separated about 110 acres of land from the rest of the farm. Most of this separated acreage was tillable. According to the operator, this separated parcel, although accessible, was inconvenient to farm. Therefore, he sold the separated parcel and rented out his remaining acreage to nearby farmers. These actions resulted in the disappearance of the unit.

Farm No. 70 was 245 acres in size in 1956. The operator was 51 years old. Although the highway did not disrupt the farmstead, it cut through the farm and left about 95 acres landlocked on the opposite side. As he had lost access to the tract, the owner-operator sold the entire farm to the Commission and used his payment to buy another farm. Thus, the unit disappeared. This operator was not contemplating retirement, as is evidenced by his purchase of a different farm.

Farm No. 41 was a 100-acre part-time farm in 1956. The owner-operator had full-time, nonfarm employment. The highway took 22 acres for right-of-way and left 27 acres on the opposite side. In addition, the right-of-way took a barn and a well. The operator indicated that the unit was unfit for farming because of the segmentation of the land and the destruction of the barn and well. Therefore, he sold the rest to the Commission, along with the land required for the right-of-way. As in the previous examples, this illustrates effects of the highway on the farm unit.

Farm No. 9 was a 220-acre farm in 1956. The 64-year-old operator owned 80 acres and rented 140 acres. The highway passed through the rented 140-acre tract. The owner of this tract sold 7 acres of right-of-way and 63 acres of excess land to the Commission. The operator indicated that the loss of the 70 acres unbalanced his crop-pasture relationship. In order to continue operating the unit, he would need to buy or rent more pasture. Instead of doing this, he dropped the remaining 70 acres of rented land from his unit. He then retired and rented out the 80 acres he owned.

The highway was of no consequence in the disappearance of 3 of the 11 farms in the taking group. The disappearance of two was due to the death of the operator. The third unit, a tenant-operated farm, was sold and later placed in the Soil Bank by the new owner. It thus seems that the highway was a major factor in the disappearance of 8 of the 11 taking farms that went out of existence.

An additional point should be made about the farms that went out of existence. These farmers took advantage of the opportunity to sell excess land to the Commission. Of the 11 units that disappeared, 5 operators sold an average of 76 acres of excess land. The owner-operators of 3 farms sold their entire units to the Commission. Thus, purchases of excess land by the Commission provided a market for those who wished to dispose of some or all of their land, a market that might not have existed in the absence of the excess purchase policy.

Turnover of Farm Operators

This section focuses on a second possible adjustment by farm operators - the departure of the operator from the unit while leaving the unit intact. Data are presented on the turnover in farm operators on those units that remained in existence from 1956 to 1959.

A comparison between the two groups indicated little difference in either the number or percentage of farms that had a change of operator (table 7). Although the highway changed the 69 units in its path that remained in existence between 1956 and 1959, the operators of these units did not react to the change by leaving their farms. Thus the highway seemed to affect the turnover of farm operators very little, and the expectation that it would do so was not borne out by the data collected.

Table 7.- Turnover of farm operators, 1956 to 1959

Farms	Taking farms	Control farms
	Number	Number
Total farms in group, 1959 -----------	69	77
Same operator, 1956 to 1959 -------	63	72
Change in operator, 1956 to 1959 --	6	5
	Percent	Percent
Percentage of farms that changed operators, 1956 to 1959--------------	8.7	6.5

Farm Tenure Pattern

Comparison of the distribution of farm operating units by tenure class reveals little change for either the control or the taking group between 1956 and 1959 (table 8). In fact, a review of owner-operated farms in the taking group indicated that not one added land through rental. Apparently, then, the highway did not affect the tenure pattern of the farms it crossed.

Table 8.- Distribution of farms, by tenure of operator, 1956 to 1959

Tenure	1956				1959			
	Taking-group farms		Control-group farms		Taking-group farms		Control-group farms	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Owner -------	39	48.8	45	54.9	33	47.8	46	59.7
Part owner --	15	18.7	25	30.5	12	17.4	21	27.3
Tenant ------	26	32.5	12	14.6	24	34.8	10	13.0
Total ----	80	100.0	82	100.0	69	100.0	77	100.0

Although the tenure pattern for the taking group was constant from 1956 to 1959, this condition does not rule out other possible adjustments in farm size. For example, an owner-operator may buy additional property to replace land lost without changing his tenure. In addition, he may rent out some of the land he owns and remain an owner-operator. Likewise, a tenant can rent additional land and a part owner can either rent or buy additional land without causing a change in tenure. The frequency of these several types of real estate transactions and the role of the Commission in these transactions is analyzed in the section that follows.

Frequency of Real Estate Transactions

Three comparisons were made between the taking and the control groups in analyzing the frequency of real estate changes. The comparisons were between (1) real estate changes in the taking group involving the Commission's purchase or disposition of excess land and all real estate changes in the control group; (2) real estate changes in the taking group other than excess land and all real estate changes in the control group; and (3) all real estate changes other than right-of-way in the taking group and all real estate changes in the control group. Each comparison was limited to transactions by operators of units that remained in existence throughout the 1956-59 period. In an earlier section, it was stated that some operators adjusted to the highway by disposing of their units. This section focuses on real estate transactions, a major adjustment by operators of those farm units that remained in existence.

Transactions with the Commission

Through its purchase and sale or rental of excess land the Highway Commission was a party to 32 real estate changes in the taking group. 27/ Many of these transactions involving excess land were made at the time the right-of-way was acquired. Of the 32 transactions, 19 were purchases of excess land and 13 were sales or rentals of excess land to farmers. These 32 transactions were spread among 23 of the 69 farms in the taking group that remained in existence from 1956 to 1959 (table 9). The transactions in the taking group to which the Commission was a party were almost as numerous as all real estate transactions in the control group. There were 32 of the former and 35 of the latter. This similarity gives some indication of the importance of the Commission's land-acquisition and disposal policies in real estate adjustment by farms in the taking group. 28/

Transactions with others

A second comparison was made between the number of real estate changes in the taking group excluding Commission transactions and the total number of real estate changes in the control group. This comparison showed that the frequency of real estate changes was substantially greater in the taking than the control group. Farms in the taking group had 51 real estate changes and those in the control group 35 (table 10). These transactions involved 43 percent of the farms in the taking group and 34 percent of those in the control group. A majority of the transactions in both the taking and control groups were rentals.

27/ Five additional purchases of excess land were made by the Commission from units that went out of existence.

28/ The number of transactions involving excess parcels also indicates the need for an evaluation of highway land acquisition (and disposition) policies in any study of adjustments by property owners or operators to a highway.

Table 9.- Real estate changes with Iowa Highway Commission 1/

Type of transaction	Farms	Transactions	Total acreage
	Number	Number	Acres
Sale of excess to Commission	18	19	741
Purchase of land from Commission	5	6	369
Rental of land from Commission	4	7	197
Total farms having transactions with Commission	23	xxx	xxx
Percentage of farms having transactions with Commission	33.3	xxx	xxx

1/ Excludes right-of-way sales and transactions by farms that went out of existence.

Table 10.- Real estate changes other than those involving Highway Commission 1/

Type of transaction	Taking-group farms			Control-group farms		
	Farms	Transactions	Total acreage	Farms	Transactions	Total acreage
	Number	Number	Acres	Number	Number	Acres
Land dropped by-						
Renting to others	4	5	592	0	0	0
Ceasing to rent	12	14	1,356	11	13	1,235
Sale	3	3	31	4	4	194
Land added by-						
Renting from others	14	20	2,177	11	12	1,147
Purchasing	9	9	1,104	6	6	573
Ceasing to rent to others	0	0	0	0	0	0
Total rental changes	22	xx	xxx	18	xx	xxx
Total purchase changes	12	xx	xxx	9	xx	xxx

1/ Does not include data on farms that went out of existence.

In terms of both transactions and number of farms involved, there were more real estate changes in the taking group. The relative frequency of real estate changes in the control group indicates that farm real estate adjustments were occurring in the community at the time the highway was constructed. However, the difference between the taking group and the control group is large, especially regarding number of transactions. Therefore, we may conclude that the highway increased the number of real estate changes. It is likely that the number of real estate changes not involving the Commission would have been larger for the taking group, if the Commission had not undertaken the policy of buying and selling or renting excess land.

All real estate transactions

The taking group had 32 real estate changes to which the Commission was a party, plus 51 other real estate changes. These 83 transactions involved about 60 percent of the farms that were in existence from 1956 to 1959. In comparison, the 35 real estate changes in the control group involved about a third of the control farms. These 83 transactions for the taking group involved a larger total acreage than the 35 transactions for the control group. The taking group farms added a total of 3,847 acres - 566 acres through transactions with the Commission and 3,281 acres through other transactions - and the control group farms added 1,720 acres. Further, farms in the taking group dropped a total of 2,720 acres - 741 acres through transactions with the Commission and 1,979 acres through other transactions - while farms in the control group dropped 1,429 acres. Adding land by rental and dropping land that had been rented accounted for most of the change in acreage in both the taking and the control groups.

Table 11 summarizes all real estate transactions in which taking and control farms were involved. The section that follows presents some evidence of the prices at which the land marketed was bought or sold.

Table 11.- Summary: Farms reporting real estate changes, 1956 to 1959 1/

Item	Farms	
	Number	Percent
Taking-group farms reporting real estate transactions---------	41	59.4
Excluding transactions with Highway Commission------------	30	43.5
Control-group farms reporting real estate transactions---------	26	33.8

1/ Rental changes, purchases, and sales. Excludes right-of-way sales and transactions by farms that went out of existence.

Farm Real Estate Prices

The data on land values yielded by the study do not permit a reliable assessment of the impact of the highway on sales prices. The number of transactions was not large, and the information obtained on each sale was often incomplete and sometimes inaccurate. There are a number of reasons for this deficiency. [29] As the study was focused on farm operating units, tenants rather than landlords were interviewed when rental was involved. Several of the tenants did not know the amounts paid or received by their landlords for real estate. Some of the owner-operators were reluctant to give information as to land they had bought or sold. To complicate matters, county records of real estate transactions frequently lacked the acreage, price, or revenue stamp information necessary for the computing of per acre prices. These several conditions precluded a complete analysis of the price effects of Interstate 35 on abutting farms.

Table 12 summarizes the sales information that seemed reliable. It is clear that the expectation of higher sales prices for land bought and sold by the taking group is supported by the data. In terms of both maximum prices paid and average values, taking-group sales prices substantially exceeded those in the control group. While the fragmentary nature of the information obtained precludes a definite conclusion on the impact of the highway, the information presented is consistent with the hypothesis presented earlier. [30]

Farm Size

An important result of the real estate activity discussed is change in the size distribution of farm operating units. The changes exhibited by the sample farms are consistent with our hypothesis of a more rapid rate of increase for taking farms after acquisition. The relevant data are presented in table 13. In 1956, the taking-group farms averaged 278 acres in size. Acquisition of land for the highway occurring in 1957 caused the average size to drop to 259 acres. From the time of acquisition in 1957 to September 1959, the average size rose from 259

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[29] It should perhaps be stressed that a major reason for the inconclusive information on land values is that the difficulty and expense of obtaining reliable sales data precluded a thorough study of land values. The many partial taking studies underway by State highway departments should help to fill in some of the gaps in our knowledge of this subject.

[30] An interview with the County Assessor of Warren County (January 28, 1960) disclosed that the assessor had not observed any change in values of farm real estate near the highway. He indicated that there were too few sales of property along the highway to make any upward or downward adjustment in his valuation of those properties.

Table 12.- Sales and price per acre of farm real estate, 1956-59

Type of land and farm group	Sales	Price		
		Average per acre	Upper limit	Lower limit
		Dollars	Dollars	Dollars
More than one-half tillable:				
Taking-group farms---	14	195.20	[1] 1,000.00	69.00
Control-group farms--	5	136.80	250.00	71.90
Less than one-half tillable:				
Taking-group farms---	2	189.80	202.70	49.30
Control-group farms--	5	66.80	80.00	60.00
All land:				
Taking-group farms---	16	193.70	---	---
Control-group farms--	10	100.00	---	---

[1] This land was to be used for residential uses. All other sales appeared to be for agricultural uses. Exclusion of this sale would not appreciably lower the average sales value for the taking farms.

to 286 acres, an increase of 10.3 percent in about 2 years. Thus by the end of the 1956-59 period, the average farm size in the taking group had recovered from the reduction caused by land acquisition and had increased beyond the 1956 pre-acquisition size by about 3 percent (table 13). These rates of growth should be compared with the gradual increase of 2 percent in average farm size for the control group between 1956 and 1959.

Although the taking farms as a group showed a faster rate of growth than other farms in the community, some noteworthy differences in changes in acreage are shown by individual farms within each group. One difference is that the proportion of farms that had an increase or a decrease in acreage in the taking group from the time of acquisition to 1959 was about double the proportion of farms with such changes in the control group (table 14). Of the 77 control farms remaining in existence in 1959, 53, or about 69 percent of the control group, held a constant acreage between 1956 and 1959. During this 3-year period, 21 percent of the control farms showed an increase in acreage while 10 percent showed a decrease. By contrast, from the time of acquisition to 1959, 39 percent of the taking farms showed an increase in acreage while 22 percent showed a decrease.

Table 13.- Change in average size of farm, by tenure, 1956 to 1959

Farm group and tenure	1956		After acquisition 1/		1959 3/		Change in acreage from	
	Farms	Average size	Farms	Average size 2/	Farms	Average size	1956	Acquisition
	Number	Acres	Number	Acres	Number	Acres	Percent	Percent
Taking-group farms:								
Owners ----------------	39	207.6	36	195.6	33	206.4	- 0.6	5.5
Part owners ----------	15	405.5	15	381.1	12	357.3	-11.9	- 6.2
Tenants ---------------	26	309.9	26	276.3	24	359.2	15.9	30.0
All taking-group farms ----------	80	278.0	77	259.0	69	285.8	2.8	10.3
Control-group farms:								
Owners ----------------	45	185.3	xx	xxx	46	186.2	.5	xxx
Part owners ----------	25	272.4	xx	xxx	21	304.1	11.6	xxx
Tenants ---------------	12	271.8	xx	xxx	10	270.4	- .5	xxx
All control-group farms ----------	82	224.5	xx	xxx	77	229.3	2.1	xxx

1/ Excludes units that went out of existence at the time of acquisition.

2/ Total acreage plus land received from Highway Commission in right-of-way transactions less right-of-way and excess sold to the Commission.

3/ Averages computed on basis of number of farms that existed in 1959 and therefore exclude the farms that went out of existence between the time of acquisition and 1959.

Table 14.- Farms by percentage change in size, 1956 to 1959

Change in size	Taking farms: Change 1956 to 1959		Taking farms: Change from time of acquisition to 1959 1/		Control farms: Change 1956 to 1959	
	Number	Percent 2/	Number	Percent 2/	Number	Percent 2/
No change -------	1	1.5	27	39.1	53	68.8
Percentage increase:						
0 to 4 -------	1		7		1	
5 to 9 -------	2		1		1	
10 to 19 -------	2		5		6	
20 to 29 -------	5		2		2	
30 to 49 -------	1		4		1	
50 to 74 -------	4		1		2	
75 or more -----	4		7		3	
Total -------	19	27.5	27	39.1	16	20.8
Percentage decrease:						
0 to 4 -------	12		3		0	
5 to 9 -------	11		2		1	
10 to 19 -------	11		2		1	
20 to 29 -------	5		2		1	
30 or more -----	10		6		5	
Total -------	49	71.0	15	21.8	8	10.4
Went out of existence ---------	11		8		5	

1/ Change was computed from the net size of the unit after right-of-way acquisition.

2/ Based on number of farms in existence in 1959.

A second noteworthy result appears in comparing the change in size of individual farms in the two groups. The average size of farm for the taking group in 1959 was above the 1956 or pre-acquisition average for the group. But this increase in average size is accounted for by only slightly more than a fourth of the taking-group farms. The group averages hide the fact that seven-tenths of the farms in the taking group were smaller in 1959 than in 1956 and that a majority of these farms operated with a reduction in acreage of 10 percent or more.

The change in tillable acres per farm is similar to the change in total acres. Between 1956 and 1959, average tillable acreage per farm increased by 1.5 percent in the control group and by 5.2 percent in the taking group. Thus by 1959, the average acreage of tillable land per farm in the taking group had recovered from the reduction caused by land acquisition and had increased 5 percent beyond its 1956 or pre-acquisition level. The taking group showed an even greater percentage increase in tillable acres per farm than in total acres per farm. Farm operators in the taking group tended to replace nontillable acres lost in land acquisition with tillable acres. This practice resulted in a slight increase in the percentage of tillable acres per farm in the taking group (table 15).

As in the case of total acres, only about 3 in 10 farmers in the taking group were able to add enough tillable acres to surpass their 1956 acreages of tillable land. Some 62 percent of the taking farms were operating with less tillable land in 1959 than they had in 1956. A majority of these farms showed a decrease of 20 or more acres in tillable land (table 16).

Thus, it may be seen that Interstate Route 35 had several effects on farms in its path besides the reduction in size of farms and the disruption of farmsteads. The rate at which farms in its path went out of existence and were incorporated into other operating units was increased. Because of the highway, with its land acquisition and severance features, elderly farm operators seemed inclined to dispose of their operating units and retire. Interference with farm operations caused by the highway prompted some operators to dispose of their units by sale or rental to others, who added them to their own farm operating units. But the turnover of farm operators for the units in its path did not increase. Nor was the tenure pattern of the farms involved changed.

The highway increased the number of real estate changes in farms in its path. Many of these changes can be traced directly to the purchase and sale or rental of excess land by the Commission, and an even larger number that did not involve the Commission were made. The total number of these transactions and the acreage added and dropped by these farmers was much larger than those for the control-group farms.

Table 15.- Farms by change in tillable acres, 1956 to 1959

Change in tillable acreage	Taking-group farms		Control-group farms	
	Number	Percent 1/	Number	Percent 1/
No change	7	10.2	49	63.6
Percentage increase:				
0 to 4	2		1	
5 to 9	0		1	
10 to 19	1		3	
20 to 29	4		1	
30 to 49	4		1	
50 to 74	3		3	
75 or more	5		3	
Total	19	27.5	13	16.9
Percentage decrease:				
0 to 4	8		1	
5 to 9	14		1	
10 to 19	6		4	
20 to 29	7		5	
30 or more	8		4	
Total	43	62.3	15	19.5
Went out of existence	11		5	

1/ Based on farms in existence in 1959.

Table 16.- Average acreages all land and tillable land, 1956 and 1959

Item	Taking-group farms		Control-group farms	
	1956	1959	1956	1959
	Acres	Acres	Acres	Acres
All land	278.0	285.8	224.5	229.3
Tillable land	174.4	183.4	152.6	154.9
	Percent	Percent	Percent	Percent
Tillable acreage as percentage of total acreage	62.7	64.2	68.0	67.6

As a result of the purchases, sales, and rentals of property by the taking group, the increase in average size of farm was greater for this group than for the control group. However, not all farms shared in this rapid growth. A majority of the operators of farms in the taking group were unable to expand their total or tillable acreages above their 1956 or pre-acquisition levels.

CHAPTER 6 - DISPERSION OF LAND IN OPERATING UNITS

The preceding two chapters covered farm operators' adjustments to two major initial effects of the partial taking - reduction in the size of the operating unit and loss of some or all of the farm buildings. The taking of land may also have the additional immediate effect of splitting the farm into two or more parcels separated from each other by the highway. This type of disruption and farm operators' adjustments to it make up the subject of this chapter. Emphasis is on the nature and extent of farm segmentation, the ways in which some farm operators dispose of parcels separated from the farmstead by the highway, the problems that arise in operating separated parcels, and the resulting dispersion of land in the farm unit. To facilitate discussion, parcels of land that are split from the farm headquarters by the highway are called separated parcels.

A highway with the design and alignment characteristics of Interstate 35 is almost certain to produce considerable farm segmentation. Limitation of access, location through the centers of sections, and the spacing of interchanges lead to separation of land parcels from the farm headquarters, to the landlocking of some of these parcels, and to a decrease in the accessibility of others. Given this immediate impact on farm operations, two consequences were expected to follow. Some farmers were expected to adjust by disposing of the separated parcels and acquiring replacement land more accessible to their farm headquarters. The effect of the highway in increasing dispersion was expected to be evident in 1959, that is, the dispersion of land in taking-group farms in 1959 would be greater than in control-group farms. The evidence relating to these two expectations is presented later in this report. The immediate effect of the highway taking on land dispersion is reviewed here.

The Extent of Farm Segmentation

Three general classes of farm segmentation resulting from highway taking can be distinguished. The first is the splitting of a previously contiguous unit, with part of its land left on one side of the highway and part on the other. In this instance, the highway takes some land from the unit and separates part of the farm from the headquarters. If landlocking occurs, it is most often associated with this type of segmentation.

As a second type of land separation, the highway can cut through part of a farm unit that was originally composed of noncontiguous parcels. The following examples illustrate this case. Farm A consists of two parcels a mile apart. The highway passes between the two, taking a strip of land from the edge of one. In this instance, the highway not only takes land from one of the parcels but also acts as a barrier between that parcel and the separated parcel, previously a mile away. This second type of land separation seldom results in the landlocking of the previously noncontiguous parcel.

Third, a highway can pass between two tracts of land in a farm unit that are some distance apart and act as a barrier between them without crossing either tract. Although no land in the unit is taken, the highway, through its barrier effect, separates one tract from the other. Of the three types of land separation mentioned, only the first two were analyzed in the course of the study. The additional interviews and expenditures required to detect and analyze the third type could not be made, but probably the number of farms involved is not large.

As a starting point, we turn to the immediate impact of right-of-way taking on dispersion of land in the taking-group farms. The purpose is to indicate the magnitude of the problem that faces both the Highway Commission and the operators involved when only the actual right-of-way requirements are considered. For this reason, farms that went out of existence immediately are included, and the purchase of excess land by the Commission is ignored for the present. Both of these factors are discussed later in this chapter when the disposition of separated parcels is considered as part of the process of adjusting farm operations to the taking. A description follows of how the 80 taking farms would have fared if (1) the Highway Commission had purchased no excess land, (2) the Commission had engineered no land trades among taking farms, and (3) none of the taking farms had gone out of existence at the time of acquisition.

Of the 80 farms that lost some land to the highway, exactly half of them had land separated by it from the farm headquarters. These 40 farms had a total of 43 separated parcels. About seven-eighths of the parcels were segmented from contiguous farm units. The rest were parcels that had not previously adjoined the farm headquarters.

Several measures can be used to indicate the extent of the land separation on these 40 farms. One is the acreage in the separated tract. Another is accessibility of the separated tract to the farm headquarters, that is, whether or not the operator can reach it by road or other means. A third is the distance that must be traveled by the operator to reach the separated tract. Each of these measures is clearly relevant to the efficiency of farm operations.

As a measure of the acreage involved, the 40 farms segmented by the highway were left with an average of 66 acres on the opposite side of the highway from the farm headquarters. While a fifth of these farms had less than 20 acres separated, slightly more than a fourth of them had more than 100 acres of the unit separated. A majority of the farms had between 20 and 100 acres of land in separated parcels (table 17).

The second measure of segmentation, accessibility, is presented in table 18. Of the 43 separated parcels, 27, or 63 percent, were accessible to the operator by road, with a few accessible by both cattle pass and road. The remaining 16 parcels, 37 percent of the total, were landlocked by the highway. All of these landlocked parcels came from the group previously separated from contiguous farm operating units. Considering only the group of separated parcels that previously adjoined their farm headquarters, somewhat less than half were landlocked by the highway.

Table 17.- Farms by acreage of land separated from farm headquarters by highway 1/ 2/

Land separated (acres)	Number	Percent 3/
0	40	50.0
1 to 19	8	10.0
20 to 49	12	15.0
50 to 99	9	11.2
100 to 149	9	11.2
150 or more	2	2.5
Average acres separated 4/	66.0	

1/ Includes all farms in taking group in 1956.

2/ Includes farms having noncontiguous land that was made more distant by the highway as well as farms having contiguous land separated by the highway.

3/ Data do not add due to rounding.

4/ Based on the 40 segmented farms.

Table 18.- Segmented farms by accessibility of separated tracts to farm headquarters

Nature of accessibility	Farms with 1/ -			
	Tract previously contiguous		Tract previously noncontiguous	
	Number	Percent 2/	Number	Percent 2/
Road and cattle pass--------	3	3.8	0	0
Road only------------------	18	22.5	6	7.5
Landlocked-----------------	16	20.0	0	0

1/ Three farms are counted twice because each had 2 tracts in different accessibility categories.
2/ Based on all farms in taking group.

The third measure of farm segmentation is the distance the operator must travel to operate his separated parcel. Route 35 is a high-design highway with places to cross the highway located from 1 to 6½ miles apart. The barrier to cross traffic raised by the highway resulted in a separation between farm headquarters and separated parcels of from one-half mile to more than 5 miles. Analyzing distance of travel by type of parcel, we find an average increase of 2 miles in the road distance traveled to reach separated parcels that were previously contiguous, and an average increase of 3 miles to reach separated parcels not previously adjoining their farm headquarters (table 19).

This then is the situation that faced farmers and the Highway Commission when only the land requirements for rights-of-way are considered. Fully half of the taking farms were split by the highway, and of the separated parcels, just over a third were landlocked. We turn now to a discussion of the use and disposition of the separated parcels, considering both adjustments to which the Highway Commission was a party and those that did not involve the Commission.

Disposition of Separated Parcels

Whether the farm operator is an owner or a tenant, he has some alternatives when faced with the prospect of having land separated from his farm headquarters by the highway. One alternative is to dispose of the separated parcel and try to acquire additional land that is more

Table 19.- Segmented farms by increased distance from farm headquarters to separated tract 1/

Increased distance from headquarters to tract (miles)	Farms with 2/ -	
	Tract previously contiguous	Tract previously noncontiguous
	Number	Number
Less than 1	4	1
1 to 1.9	7	0
2 to 2.9	4	1
3 to 4.9	4	3
5 or more	2	1
	Miles	Miles
Average increase	2.0	3.2

1/ Includes only separated tracts accessible by road.
2/ Three farms are counted twice because each had 2 tracts in different accessibility categories.

accessible to the farm headquarters. Of the 35 farms with separated parcels that remained in existence, about half of them disposed of the parcel in one way or another (table 20). In most instances in which the separated parcel was dropped from the unit, it was sold to the Highway Commission at the time the right-of-way was acquired. On the owner-operated farms, this decision to sell to the Commission was made by the operator. However, there were also several tenant-operated farms from which a separated parcel was sold to the Commission. It is not known whether the tenant's wishes were taken into account by landlords in their decisions to dispose of these parcels.

Although a majority of the separated parcels were dropped through sale to the Commission, some were disposed of in other ways. In two instances, owner-operators rented out the separated parcel. In two others, operators dropped their separated parcels by ceasing to rent them from others.

Table 20.- Segmented farms by disposition of separated tracts

Tract	Farms going out of existence 1/	Farms by disposition of tracts 2/			
		Sold to Highway Commission	Rented out	Ceased to rent	Retained
	Number	Number	Number	Number	Number
Previously contiguous:					
Not landlocked--------	2	6	1	0	12
Landlocked-----------	2	10	1	0	3
Previously noncontiguous:					
Not landlocked--------	1	0	0	2	3
Landlocked-----------	0	0	0	0	0

1/ Of the farms going out of existence, 3 had tracts sold to the Highway Commission and 2 had tracts sold to individuals.

2/ Three farms are counted twice because each had 2 tracts in different accessibility categories.

Use of Separated Parcels Retained

A third alternative open to the operator is to retain the separated parcel in the operating unit and continue to use it. This course of action was followed by operators on about half the 35 segmented farms that remained in existence. In many instances, however, the use of the segmented parcel presented operating difficulties. For example:

Farm No. 29 had some pastureland that was crossed by the highway. The highway separated about 80 acres, chiefly pasture, from the well that served it. The owner-operator found it necessary to drill a stock well on the separated parcel in order to make the pasture useful for his livestock. He indicated that he now wishes to sell it.

Farm No. 30 was left with 60 acres, chiefly pasture, on the far side of the highway. The operator had to drive his livestock over the overpass near his pasture. As the ditches near the overpass are not fenced, the cattle can run into the path of vehicles on the Interstate highway. Further, the pasture now abuts on the highway right-of-way. These factors have greatly increased the risk in using the pasture. The extra supervision and labor required has made the parcel inconvenient to operate. Although the operator has not listed the separated parcel for sale, he said that he wishes to sell it.

Farm No. 61 had about 230 acres separated from the farm headquarters. Half of the tract was pasture and the rest was cropland. To use the separated parcel more efficiently, the operator decided to construct a cattle shed on it. He also rearranged some fences because of a drainage problem caused by the highway. The operator feels that the gasoline, time, and labor required in movement to and from the separated land, now 1½ miles away, is costly.

These several examples indicate two facts. One is that operation of the separated parcels results in both inconvenience to the operator and increased cost of production. Second, because of these operating difficulties, some operators plan to dispose of the parcels.

Some additional conclusions can be drawn. Apparently, the use or disposition of these parcels was not related to tenure of the operator. Of the 16 tenant-operated parcels and the 17 owner-operated parcels, about half were retained in their farm operating units and about half were dropped from them (table 21). However, the use or disposition of a parcel was closely related to its accessibility. Of the 16 separated parcels that were landlocked, only 3, or about a fifth of the parcels were retained in the operating units. Of the 27 separated parcels that were accessible by road, 15, or nearly three-fifths, were retained in the farm units (table 20). Thus, while most of the landlocked parcels were dropped from their units, a majority of the parcels that were not landlocked were retained.

Table 21.- Tracts separated from farm headquarters by the highway, classified by disposition of tract and tenure of operator

Tenure of operator	Disposition of tract				
	Sold to Highway Commission	Sold to other than Highway Commission	Rented to others	Ceased to rent	Retained
	Number	Number	Number	Number	Number
Owner ----------------	7	2	0	0	8
Part owner -----------	3	0	2	2	3
Tenant ---------------	9	0	0	0	7
Total -------------	19	2	2	2	18

One additional aspect of the disposition of separated parcels merits attention. Table 21 indicates that 3 in 4 of the separated parcels dropped from farm operating units were sold to the Highway Commission. Thus, the Commission's land acquisition policy obviously facilitated the sale of both landlocked and other separated lands. Without the excess acquisition policy, it is likely that many owners would have been forced to hold these parcels until they could sell or rent them to other farmers in the area.

Changes in Dispersion, 1956-59

The trend in farm size is generally upward throughout the United States. As this expansion occurs, we can expect the land parcels in a farm to become more dispersed. In adding land to his unit, an operator may find land available only at some distance from his farmstead. As he increases his farm size, he is likely to have more acres of land and probably more parcels that do not adjoin his farmstead.

The control-group farms show the trend in the study area toward greater dispersion of land within farms (table 22). Between 1956 and 1959, the proportion of control farms with land tracts not adjoining the farm headquarters increased from 27 to 38 percent. During the same period, the percentage of the control-group farms having 50 acres or more of such noncontiguous land increased from 23 to 34 percent (table 23). This trend indicates that the farms in the taking group probably would have shown some increase in the dispersion of their land whether or not the highway had been constructed.

A comparison of changes in the taking and control groups suggests that the highway substantially increased the dispersion of land in those farms it crossed. During the 1956-59 period, the percentage of taking farms operating noncontiguous tracts doubled, rising from 31 to 62 percent, an increase substantially greater than that shown by the control group. The taking group also showed a greater increase in acreage of land that did not adjoin a farm headquarters. During the 1956-59 period, the percentage of farms in the taking group having 50 or more acres of such land rose from 30 to 49 percent (table 23). This increase compares with the control-group increase, noted earlier, of 23 to 34 percent.

Another indication of dispersion is the distance from the farmsteads of the noncontiguous land. During the 1956-59 period, the percentage of all land in the taking-group farms 1 or more miles from farm headquarters rose from 22.6 to 38.3 percent. This was an absolute increase of 2,532 acres. The amount of land 2 or more miles from farm headquarters increased by 1,265 acres, that of land 3 or more miles distant by 640 acres, and that of land 4 or more miles distant by about 750 acres (table 24). 31/

31/ It could not be determined whether the acreages at these several distances were greater or less than those listed immediately after highway land acquisition.

Table 22.- Farms by number of tracts not adjoining farm headquarters, 1956 and 1959

Item	1956		1959	
	Taking-group farms	Control-group farms	Taking-group farms	Control-group farms
	Number	Number	Number	Number
Farm with -				
1 tract	15	20	28	27
2 tracts	5	2	8	2
3 tracts	4	0	3	0
4 tracts	1	0	1	0
5 tracts	0	0	3	0
Total farms with noncontiguous tracts	25	22	43	29
	Percent	Percent	Percent	Percent
Farms with noncontiguous tracts as percentage of all farms	31.2	26.8	62.3	37.7
	Number	Number	Number	Number
Average number of tracts not adjoining farm headquarters 1/	1.64	1.09	1.67	1.07

1/ Based on number of noncontiguous farms.

Table 23.- Farms by acreage of land not adjoining farm headquarters, 1956 and 1959

Noncontiguous land (acres)	Taking-group farms				Control-group farms			
	1956		1959		1956		1959	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
0	55	68.8	26	37.7	60	73.2	48	62.3
1 to 49	1	1.2	9	13.0	3	3.7	3	3.9
50 to 99	7	8.8	8	11.6	10	12.2	13	16.9
100 to 149	1	1.2	4	5.8	2	2.4	2	2.6
150 to 199	6	7.5	3	4.3	3	3.7	6	7.8
200 to 249	1	1.2	7	10.1	1	1.2	3	3.9
250 to 299	3	3.8	4	5.8	0	0	1	1.3
300 or more	6	7.5	8	11.6	3	3.7	1	1.3

Table 24.- Noncontiguous land in farms: Acreage and percentage distribution by distance from farm headquarters, 1956 and 1959

Distance from farm headquarters (miles)	1956		1959	
	Acres	Percent	Acres	Percent
Taking-group farms:				
10 or more	80	0.4	485	2.5
6 " "	1,279	5.8	1,628	8.3
4 " "	1,919	8.6	2,670	13.5
3 " "	3,352	15.1	3,992	20.2
2 " "	4,101	18.4	5,366	27.2
1 " "	5,030	22.6	7,562	38.3
All noncontiguous land 1/	5,185	23.3	7,874	39.9
Control-group farms:				
10 or more	160	.9	170	1.0
6 " "	245	1.3	255	1.4
4 " "	725	3.9	555	3.1
3 " "	900	4.9	930	5.3
2 " "	1,340	7.3	1,210	6.9
1 " "	2,527	13.7	3,105	17.6
All noncontiguous land 1/	2,822	15.3	3,600	20.4

1/ Includes land less than 1 mile from farm headquarters.

During this period, the percentage of all land in the control group located 1 or more miles from its farmstead increased from 13.7 to 17.6 percent. This is an absolute increase of 578 acres and is about one-fourth of the increase shown by the taking group. There was little change in acreages of land located 2, 3, and 4 or more miles from the farmstead.

Thus, the highway increased the dispersion of land parcels in farm operating units. It did this directly by separating and isolating some parcels from the headquarters. It had also an indirect effect on farm dispersion. In several instances in which operators replaced land lost to the right-of-way or separated parcels dropped from their units, they added land that was 1 or more miles from their headquarters. Although the data necessary to determine the precise number of such instances were not obtained, the effect of land replacement on dispersion should not be overlooked.

Thus it is clear that a high-design highway can materially alter farm resource use. Interstate 35 increased the number of land parcels that did not adjoin the farm headquarters and the number of farms having such parcels. It also increased the total acreage of these parcels and the distance between them and their farm headquarters.

About two-fifths of the separated parcels were retained by the farmers, despite the difficulty of operating them. Slightly less than three-fifths of these separated parcels were dropped from the farm unit by the owner or operator. Most of the parcels dropped were sold to the Highway Commission during the highway land acquisition period. In some instances, however, owner-operators rented out these parcels and tenant-operators ceased to rent their parcels.

These adjustments reduced the dispersion of land in the taking group, but in comparison with control-group farms, taking-group farms showed a greater increase in number and acreage of noncontiguous parcels, as well as in distance from the farm headquarters of this dispersed acreage.

CHAPTER 7 - ADJUSTMENTS IN LABOR, MACHINERY, AND FARM ENTERPRISES

Through its effect on farm size and dispersion of land, partial taking can be expected to influence other aspects of resource use within operating units. This chapter focuses on adjustments in the use of labor, in machinery investment, and in the size of farm enterprises. It discusses also several miscellaneous effects which particular farmers in the taking group considered important.

Because a majority of taking-group farms were smaller in 1959 than they were in 1956, and because, during the same period, the dispersion of land increased, the following three hypotheses about resource use seemed reasonable. The first is that the smaller land area would mean a relative oversupply of labor that would result in an increase in off-farm work. Second, through a similar chain of reasoning, we expected that taking farmers would be less likely than other farmers in the area to buy new machinery or to replace their old machines; and third, the initial decrease in farm size and the subsequent changes in land holdings by taking farmers would lead to above-average variability in the size of their crop and livestock enterprises.

Use of Labor

The study did not attempt a precise measurement of the adequacy of the amount of labor used by farm operating units. However, an indirect indication of a "surplus" of labor can be found in the diversion of family labor to nonfarm employment or in the reduction of the amount of hired labor employed. Changes between 1956 and 1959 in off-farm family labor and in hired labor were measured for the taking and control groups, in order to learn whether meaningful differences existed. A substantial percentage of the farms in both groups had off-farm employment by some member of the farm household in 1956 (table 25). In addition, there was an increase over time in the percentage of farms in both groups having off-farm employment. The significant feature for purposes of this study is that farm households in the taking group had a slightly greater increase in off-farm employment between 1956 and 1959 than the control group. The percentage of taking-group households with off-farm employment rose from about 29 to 39 percent, an increase of a third, while the percentage of control-group households with such employment rose from about 49 to 53 percent. 32/

The slightly greater increase in off-farm employment by the taking-group households came about through diversion of the labor of the housewife and children to nonfarm jobs, rather than by a diversion of the operator's labor. Off-farm employment of operators in the two groups changed very little over time.

32/ The percentage of farms increasing the amount of off-farm employment was also larger for the taking than for the control group.

Table 25.- Farms reporting off-farm work, by time worked in 1956 and 1959, and changes from 1956 to 1959

Item	1956				1959			
	Taking-group farms reporting off-farm work by-		Control-group farms reporting off-farm work by-		Taking-group farms reporting off-farm work by-		Control-group farms reporting off-farm work by-	
	Oper- ators	Other members of family	Oper- ators	Other members of family	Oper- ators	Other members of family	Oper- ators	Other members of family
	Number	Number	Number	Number	Number	Number	Number	Number
Months off-farm work:								
1 or less 1/ ------	4	1	4	1	5	2	4	1
2 to 4 ------------	2	0	3	1	4	3	3	5
5 to 8 ------------	3	3	2	1	2	1	5	1
9 to 12 -----------	10	1	22	12	6	5	20	12
Over 12 -----------	0	0	0	0	0	3	0	1

	1956		1959	
	Taking-group farms	Control-group farms	Taking-group farms	Control-group farms
	Percent	Percent	Percent	Percent
Percentage of farms -				
Showing off-farm work -----------	28.8	48.8	39.1	53.2
Increasing off-farm work since 1956-	xxx	xxx	26.1	19.5
Decreasing off-farm work since 1956-	xxx	xxx	8.7	5.2

1/ Includes only farms reporting some off-farm work.

Table 26 presents a comparison of the taking and control groups in the use of hired labor over the study period. The small differences between the two groups indicate that if the highway affected the use of hired labor, the measures used did not detect the influence.

Table 26.- Use of hired labor, 1956 and 1959

Item	Unit	1956		1959	
		Taking-group farms	Control-group farms	Taking-group farms	Control-group farms
Farms using hired labor --------	Number	16	16	19	20
Hired labor per farm ---------	Month	5.8	4.6	4.9	3.9
Farms increasing hired labor --	Number	xxx	xxx	6	4
Farms decreasing hired labor --	Number	xxx	xxx	2	4

Investment in Machinery

It was expected that changes in farm size would be accompanied by changes in the same direction in the complement of machinery used on the operating unit. The failure of a majority of the taking farms to regain their preacquisition size led to the expectation that operators in this group would be less likely to buy or replace machinery than other farmers in the area. The evidence on this question, which is presented in table 27, is inconclusive. Although more farm operators in the taking group added tractors and cornpickers, more operators in the control group added balers and combines. Thus, regarding investment in machinery, there seemed to be little difference between the farms in the two groups.

A factor that may help to explain the relatively high level of machinery purchases among taking-group farms is the compensation received for right-of-way and excess land acquired for the highway. Owner-operators, some part owners, and a small number of tenants had their cash positions improved as a result of the taking, and although some of them invested in additional land, others may have used their compensation to add to their complement of machinery. In a few instances, operators in the taking group stated that they used part of the right-of-way payment to buy machinery.

Table 27.- Farms adding or dropping major pieces of machinery, 1956 to 1959 1/

Type of change	Taking-group farms		Control-group farms	
	Number	Percent	Number	Percent
Farms adding:				
Tractor	15	23.8	11	15.3
Cornpicker	7	11.1	2	2.8
Baler	2	3.2	6	8.3
Combine	1	1.6	5	6.9
Two or more of above	5	7.9	4	5.6
Farms dropping and not replacing one or more of above	5	7.9	4	5.6

1/ Includes only farms with same operator from 1956 to 1959.

A final aspect of the effect of the highway on machinery investment stems from the increase in land dispersion. Farming separated parcels may entail considerable travel over hard-surfaced roads. Transporting major items of farm machinery, particularly disks and harrows, over pavement damages both the implement and the road unless the machinery is mounted on rubber-tired wheels. Several operators in the taking group indicated that they had either bought rubber-tired equipment or planned to buy some for use on their separated parcels.

Variability of Farm Enterprises

A high degree of enterprise variability was expected to be shown by the taking farms for several reasons. Both the loss of land and the increase in dispersion may bring changes in the arrangement of fields and the size of crop and forage enterprises. The acreage of pasture may be reduced, or pastures may be split or separated from the main source of water for stock. Such changes could lead to a reduction in the number of livestock raised on the pastures affected. The operator who reduces one crop or livestock enterprise may at the same time add or increase the size of another. Such consequences as these led to the expectation that taking-group farms would show a greater tendency than control-group farms to add, drop, expand, or contract crop and livestock enterprises.

Crop enterprises

A comparison was made of the change in crop enterprises in the taking and control groups. This comparison was limited to three enterprises - corn, soybeans, and hay. For purposes of this study, these crops were considered to show a change if they were added or dropped from the farm cropping system or if they were expanded or contracted by 20 percent or more. This requirement helps to avoid inclusion of many small changes that are due to crop rotations on fields of different sizes.

Table 28 summarizes the changes in crop enterprises that were made in both the taking and control groups. As expected, taking-group farms showed slightly more variability, but the difference between the groups is too small to warrant the conclusion that the highway taking substantially affected crop enterprises for the group as a whole. 33/ It was clear, however, that individual farmers in the taking group changed their crop acreages because of the taking. Several examples will serve to illustrate the kinds of adjustment they made.

Farm No. 28 lost about 12 acres of cropland to the highway right-of-way. The operator indicated that he bought an additional 40 acres to replace this reduction in acreage, and the 35-percent increase in his corn acreage from 1956 to 1959 reflected the increase in tillable land.

Farm No. 74 lost 36 of its 150 acres to the highway right-of-way. These 36 acres included some crop and pasture land. In addition, a tract of 100 acres was left on the far side of the highway. About 30 acres of the 100 acres were cropland and the rest was in permanent pasture. As the cropland was inconvenient to farm, the operator seeded it to grass. This change in the use of the separated parcel reduced the size of his corn enterprise. The loss of cropland in the right-of-way also decreased his corn acreage. Together, these two changes caused a 50-percent decrease in corn acreage from 1956 to 1959.

Farm No. 67 lost 20 acres of cropland to the right-of-way. In addition, the highway landlocked 30 acres of cropland, which was purchased as excess by the Highway Commission. The operator was able to rent a 38-acre tract as a partial replacement for the cropland lost. Although his corn acreage changed during the process of adjustment, the net result was only a small reduction in the acreage of corn.

33/ Among factors other than highway taking that would tend to cause changes in crop enterprises and hence would operate to obscure the highway impact are the following: Changes in relative crop prices, changes in farm size that are unrelated to the highway, differences in rainfall on poorly drained bottomland, and perhaps most important, changes in the price-support program for corn.

Table 28.- Farms reporting changes in crop enterprises, 1956 to 1959

Item	Corn		Soybeans		Hay	
	Taking-group farms	Control-group farms	Taking-group farms	Control-group farms	Taking-group farms	Control-group farms
	Number	Number	Number	Number	Number	Number
Enterprise change:						
Added----------	1	4	6	1	5	5
Dropped--------	1	4	12	13	7	7
Expanded 1/----	23	22	12	11	12	21
Contracted 1/--	21	17	8	7	19	13
	Percent	Percent	Percent	Percent	Percent	Percent
Farms showing change-----------	66.7	61.0	55.1	41.6	62.3	59.7
Farms with enterprise in 1956, 1959 or both-----	98.6	97.4	73.9	59.7	95.7	94.8

1/ Must be 20 percent change in acreage planted to be counted as a change.

Farm No. 21 presents a kind of crop variability that is not associated with highway taking or purchase of replacement land. In 1959, the operator of this farm was unable to produce hay and corn on 50 acres of cropland because the land had been inundated early in the cropping season. The operator claimed that this would not have occurred if the highway had not prevented the normal run-off of surface water.

Livestock enterprises

A comparison was made also of the variability in livestock enterprises for the taking and control groups of farms. The two enterprises compared were hogs and beef cattle. As in the case of crops, these enterprises were judged to have changed if they were added or dropped or if they were expanded or contracted by 20 percent or more.

The percentages of farms showing changes between 1956 and 1959 in number of fattened hogs sold were almost identical in the taking and control groups. The percentages of farms in the two groups having changes in numbers of steers and heifers marketed between 1956 and 1959 were also about the same (table 29). The major difference between the two groups was that taking farms tended to drop their beef enterprises while control farms expanded theirs.

Table 29.- Farms reporting changes in livestock enterprises,1956 to 1959

Item	Fattened hogs sold		Steers and heifers marketed	
	Taking-group farms	Control-group farms	Taking-group farms	Control-group farms
	Number	Number	Number	Number
Added	5	4	4	4
Dropped	8	7	8	2
Expanded 1/	15	14	3	11
Contracted 1/	6	12	3	4
	Percent	Percent	Percent	Percent
Farms showing change	49.3	48.1	26.1	27.3
Farms with enterprise in 1956, 1959 or both	78.3	79.2	42.0	42.9

1/ Must be 20 percent change in number marketed to be counted as a change.

Although the overall measures of livestock change for the two groups did not indicate that the highway caused greater variability in the taking group, several examples of adjustment are of interest because of the light they throw on possible patterns of change in livestock enterprises.

Farm No. 21 lost about 30 acres to the highway right-of-way. In addition, the operator sold to the Commission as excess a 35-acre landlocked parcel of land. Because the highway reduced the acreage in pasture by 65 acres, the operator sold his cattle. He now farms only the cropland in his unit.

Farm No. 11 lost some cropland to the highway, and its corn acreage was reduced as a consequence. As not enough corn was produced for the hog and dairy enterprises on this farm, the operator reduced the size of both.

Farm No. 50 was crossed by the highway. About 50 acres of pasture, which had been used for a dairy enterprise, were left separated on the opposite side of the road. Because of the highway, the pasture was now 5 road miles from the farmstead, too far to drive the dairy cattle each day. The operator adjusted to this change by selling his dairy cows and buying beef cattle that could be left on the separated parcel.

Farm No. 15, which in 1956 was operated by a full tenant, comprised about 550 acres, of which 80 acres were pasture. Realizing that the highway taking (right-of-way and excess) would deprive him of his pasture, this operator closed out all his livestock enterprises in 1956, selling some 100 head of beef cattle, 30 sows, and 140 sheep. Beginning with the crop year 1957, however, he began to rebuild both his land holdings and his livestock enterprises. By 1959, he was operating 710 acres, of which more than 300 were in permanent pasture. While his 1959 hog and sheep enterprises were smaller than those of 1956, his beef enterprise was nearly 50 percent larger.

These examples of crop and livestock enterprise variability show, for particular operating units, both the initial impact of the taking, and the later adjustments made by the farm operator. Although the aggregate measures of variability detected only small differences between the taking and control groups, these examples indicate the kinds of adjustments a right-of-way taking can set in motion.

Miscellaneous Effects

The last question asked of each taking-group operator was the following: "Has the purchase of right-of-way or the existence of the highway affected your farming operations in any ways other than those we have already discussed? If so, in what ways?" From the answers given to this question and from other comments made by farm operators, several additional effects of the highway were identified. Although these effects cannot be analyzed in detail, they are discussed here as indications of the reactions of nearby operators to the highway improvement.

A frequently mentioned problem confronting taking-group farmers and others whose farms were near the highway was drainage. Seventeen operators in the taking group stated that the highway had caused them to have drainage problems. 34/ These operators also indicated that neighbors who had not lost land for highway rights-of-way shared these problems. The difficulties voiced by these 17 operators may be summarized into three types of problems.

One type is that the highway diverts water to adjoining fields where erosion and flooding result. In the second type, the highway acts as a dam and retards the drainage of surface water from abutting land. Either the slowing or the ponding of runoff can make a field unfit for tillage or harvesting. Because of impairment of drainage,

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34/ The unusually heavy rains that fell during the spring of 1959 may have been partly responsible for these drainage problems.

some operators abandoned several acres of cropland that were too wet to farm. A third type of problem voiced by two operators was that the placement or elevation of a highway culvert had interfered with the functioning of tile lines in abutting fields.

Several farmers mentioned the demand for services from stalled highway users. Despite the fact that the average daily traffic volume on the study segment at no point exceeded 3,000 vehicles, stalled motorists were a source of annoyance to abutting farm operators. Some farmers wanted the commission to arrange for services to stalled motorists. 35/

A few operators indicated that they traded work, exchanged machinery, or owned and used machinery jointly with neighbors or relatives who were on the far side of the highway. The spacing of overpasses required them to travel greater distances than before the highway was constructed. This circuity of travel has made exchange of labor and machinery time-consuming and costly and has thereby reduced the economic advantages of jointly owning machinery.

Some additional problems were attributed to the highway by farm operators. These problems may be summarized as follows: (1) Conflict with contractors who entered property and damaged fences before a settlement had been made with the landowner; (2) additional cost of farm liability insurance taken by operators because of the risk of livestock-automobile accidents on the highway; (3) noise from highway truck traffic; (4) spread of noxious weeds permitted to grow to seed on the edge of the right-of-way; and (5) difficulty in visiting neighbors on the opposite side of the highway.

Offsetting these adverse effects was the recognition by many operators that the highway meant less travel time to and from Des Moines and points north. The availability of the high-speed highway was particularly appreciated by those families with a member employed in Des Moines. 36/

35/ This type of problem is probably not as relevant to the study of farm operations as it is to the question of how users of Interstate highways will obtain the services they need. The latter question was beyond the scope of the study reported, and for that matter, outside the control of State highway departments. The decision to forbid service facilities on the right-of-way was incorporated in the Federal Highway Act of 1956.

Highway Commission estimates show that the average annual daily traffic on the northern portion of this highway segment in 1975 will be between 13,000 and 14,000 vehicles. This is more than a 400-percent increase over the average volume that existed in 1959. Unless there is a change in the present highway services provided, there may be a fourfold increase in the number of motorists demanding services from abutting farm operators.

36/ With the completion of the east-west segment north of Des Moines, the study area should be brought more directly into the labor market for the Firestone plant in the northern part of the city and the John Deere works at Ankeny.

Most of the indicators of change in the use of labor, investment in machinery, and variability of crop and livestock enterprises were in the direction expected, but the differences between the two groups regarding these characteristics were generally small. Analysis of enterprise variability was complicated by the number and importance of nonhighway influences affecting farm operators' decisions. Although the highway had some effect on enterprises for particular farms, the overall variability among enterprises masked these changes in the aggregate figures. Two miscellaneous effects that were of particular concern to operators were impairment of farm drainage and demands made of them by stalled motorists.

CHAPTER 8 - APPRAISAL OF THE RESEARCH METHODOLOGY

The study reported had two major objectives. One was to determine some of the effects of the highway on the farms it crossed. The second was to develop a research method for measuring these effects. This final chapter is devoted to a brief discussion of the second objective. In particular, it presents some conclusions concerning both the procedures used and possible adjustments in procedures that will be of value to others who contemplate similar studies.

The major features of the research method used are as follows:

(1) A 33-mile segment of interstate highway with complete control of access was selected for analysis. The segment passes through an agricultural area that is relatively homogeneous and has remained in agriculture since construction of the highway.

(2) Eighty farm operating units were located in the path of this highway in 1956. These taking farms were observed to determine the effects of the highway on them and their adjustment to it.

(3) A like number of control farms in the community were selected for analysis. These farms had similar soil and productivity characteristics and were located 3 miles back from the highway.

(4) Operators on the 162 taking and control farms were interviewed about their 1956 and 1959 farm operations. Operating units, not ownership tracts, were traced over time.

(5) The changes made by operators of taking farms between 1956 and 1959 were compared with those made by operators of control farms during the same period. The control farms provided a basis for determining whether the changes in taking farms were associated with the highway or were the result of other community forces.

(6) In determining the effects of the highway, the focus was upon changes in general characteristics of taking farms, such as farm disappearance, farm size, tenure, turnover of operators, land dispersion in farm units, real estate transactions, and farm real estate prices. The changes in farm labor use, in machinery investment, and in type and size of crop and livestock enterprises were measured also.

Reliability of 1956 Data

One of the first aspects of the procedure that deserves attention is the reliability of enumerated data for the 1956 crop year. Operators seemed to have little difficulty in recalling the numbers of total and tillable acres in their farms in 1956. They readily answered questions on buildings, machinery, and use of labor. But some of them had difficulty in recalling the size of their 1956 crop and livestock enterprises.

A test was made of the reliability of enumerated enterprise data for 1956. The 1956 crop acreages reported by operators who remained on their farms during the 1956-59 period were compared with their corn acreages in 1956, as shown by ASC records. 37/ In some instances, variations between enumerated and actual corn acreages were wide. However, the average acreage of corn per farm computed from enumerated farm data and the average computed from ASC records were very similar. Thus the overestimation of 1956 corn acreage by some farmers was offset by the underestimation of corn acreage by other farmers (tables 30 and 31).

This variation between enumerated and ASC data for 1956 indicates that the 1956 crop and livestock data reported by some operators may not be reliable. As a consequence, caution was used in drawing inferences from them, and possible highway influences on crop and livestock enterprises were analyzed less completely than other aspects of farm operations which were measured more accurately. If farmers find it difficult to remember the size of their enterprises 3 years in the past, it would be difficult to get from them more detailed information on their operations or information covering a longer period of time. Our initial reluctance to attempt to cover a period long enough to provide a complete picture of farm adjustment thus seems to have been justified. A longer or more detailed study would require accurate and complete farm records, or the kind of "adjustment" study in which operators are interviewed each year about their operations during the previous 12 months.

Table 30.- Average corn acreage computed from farm schedules and from ASC records, 1956 1/

Farm group	Average corn plantings from -	
	Farm schedules	ASC records
	Acres	Acres
Taking----------------------	53.2	51.1
Control---------------------	51.3	49.7

1/ Includes only farms for which ASC total farm acreage was substantially the same as that indicated on questionnaire.

37/ A check was made to make sure the difference in enumerated data and ASC data did not result from a difference in the operator's and ASC office's definition of the total farm.

Table 31.- Farms classified by percentage by which corn acreage indicated on schedules deviated from ASC records of corn acreage, 1956 1/

Deviation	Taking-group farms	Control-group farms	Total
	Number	Number	Number
Percent			
More than -40------	1	3	4
-31 to -40---------	1	2	3
-21 to -30---------	2	1	3
-11 to -20---------	2	4	6
-1 to -10----------	5	6	11
0-----------------	7	3	10
+1 to +10----------	5	5	10
+11 to +20---------	3	5	8
+21 to +30---------	2	3	5
+31 to +40---------	3	3	6
More than +40------	3	4	7

1/ Includes only farms for which ASC total farm acreage was substantially the same as that indicated on questionnaire.

Use of Control Farms

A second aspect of the research procedure that deserves comment is the use of control farms. Because control farms were used in the study, a total of 162 farms - 80 taking and 82 control - were enumerated in order to determine the effects of the highway.

Under some circumstances, county or township census data for farms might serve as a substitute for control farms. [38] For several reasons, such a substitution was not possible in the study reported. First, the highway segment chosen was long enough to cross farms in two counties. Second, the farms crossed by the highway were located at the edge of their respective counties. Third, the study period under consideration extended from 1956 through 1959. A final reason is that data for townships are available for only a limited number of farm characteristics, most of which relate to farm size or use of land. If such control data are considered to be adequate, and if the initial and terminal years of the study period correspond with census years, substitution of census data for control farms would be feasible. The primary advantage, of course, would be the coverage of a much larger sample of taking farms at the same cost or the opportunity to collect more detailed information for the farms included in the sample.

The Farm Management Approach

The study showed the general effects of the highway on the taking farms. In most instances, these effects and adjustments by operators to the highway were expressed in physical terms, such as acres of land lost and gained, number and type of real estate transactions, and miles between separated parcels and the farmstead, to name only a few. A thorough farm management analysis would have been necessary to attach definite dollar measurements to the highway effects and the costs and returns from adjustments by operators to these effects. With such a farm management analysis, it would be possible to measure:

(1) The reduction in farm income caused by a decrease in farm acreage and the added costs of operating land parcels separated by the highway;

(2) The change in the kind and intensity of land use for both separated parcels and the rest of the farm acreage as operators adjust to the loss of land and farm income;

(3) The intensity of labor and capital use for the entire farm, on particular parcels, and for particular enterprises;

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[38] Although township data are not regularly tabulated and published, they can be obtained from the Bureau of the Census on a cost basis.

(4) The immediate costs associated with crop and livestock enterprise reorganization;

(5) The income position of each farm immediately after highway land acquisition and later when the operator has made adjustments in crop and livestock enterprises and total farm acreage;

(6) The dollar investment in machinery and land before and immediately after land acquisition and after farm adjustment has occurred;

(7) The capital requirements for different types of adjustments that have been made or that could be made to increase farm income;

(8) The value of a separated land parcel to the farm unit;

(9) The possible contribution of the highway in facilitating the operation of distant separated parcels and in lowering the costs of obtaining supplies and marketing output.

These are some of the general dollar measurements that a thorough farm management analysis would make possible. As an additional advantage, this type of analysis would permit a clearer distinction between the immediate effects of the highway on farm operations and the effects that flow from operators' adjustments to the highway. For instance, the study was unable to indicate what happened to farm dispersion from the time of acquisition to 1959. A more thorough (and more expensive) analysis could provide information on whether operators' real estate changes in response to the taking had the effect of moderating or increasing the land dispersion existing immediately after acquisition.

The Community Approach

For some purposes, it would be desirable not only to study the farming area more intensively, but also to broaden the coverage to include a representative selection of all farms that might be affected by the highway. The impact of a major controlled-access facility will be far more extensive than study of a group of taking farms would indicate. Farms other than those losing land to rights-of-way will no doubt share in the redistribution of land that occurs after the taking. All farms in the local land market will feel the effects of the increase in real estate activity triggered by the highway. Nor will possible influences on travel patterns be confined to farms that border the facility. Improvements in access to distant population centers and the increased difficulty of operating parcels of land across the highway will be experienced by some farmers outside the taking group.

Of even greater significance are the changes the highway may bring to the economic character of the area. Research on economic development has only recently been getting the attention it deserves. As a result, we know very little about the process of change and the factors that set it in motion. As highway improvement brings the city closer to rural areas, it brings city jobs closer to rural people. It turns farmland into potential residential and industrial sites, and by bringing increased volumes of traffic, it creates demands for roadside services that had not existed previously. All of these factors can be expected to have a profound influence on the economy of the agricultural area through which the highway passes. Studying a broad geographical belt along the highway, and tracing development over 5 to 10 years would do much to fill the gaps in our knowledge about the impact of highway improvement in rural areas.

Annual Collection of Farm Data

Because the highway segment chosen for this study was constructed in 1957 and 1958 and the study was planned and initiated in 1959, it was necessary to rely upon the memory of operators for farm conditions from 1956 to 1959. If the study had been initiated in 1956, farm data could have been gathered for that year and for each following year.

This procedure has three major advantages:

(1) Greater reliability of data. The collection of farm data on an annual basis avoids the necessity of relying on the operator's memory for conditions 1, 2, or 3 years past.

(2) Collection of data each year would allow greater attention to the paths of adjustment followed by farm operators. The sequence of an operator's adjustments could make a considerable difference to his farm income during the adjustment period and to his total adjustment to the highway.

(3) The opportunity to study a longer adjustment period than reliance on memory permits. A more complete analysis of the impact of the taking and of operators' adjustments to it may thus be made.

APPENDIX

Highway Planning, Land Acquisition, and Farm Adjustment

Brief mention was made earlier in this report of the highway-planning and land-acquisition policies of the Commission. Chapter 4 indicated that the planning and land-acquisition policies and procedures used by the Commission influenced the ease with which farm operators could adjust their units. The same procedures and policies and the resulting highway facilities influence the nature and magnitude of the adjustments the farm operator will need to make. As they affect farm adjustment, the procedures and policies used in planning and constructing this segment of Interstate Route 35 are discussed in this appendix. For purposes of contrast, some of the present procedures and policies of the Iowa State Highway Commission are presented also.

Selecting the Alignment

In selecting the possible alternative routes for Interstate 35, location engineers gave particular attention to such engineering considerations as cut, fill, grade, required drainage structures, and destruction of farm and urban buildings. In the choice of these routes and in locating overpasses and interchanges, they gave attention also to local traffic patterns. In addition, location engineers delineated ownership boundaries for properties in the path of each of the alternative routes. As ownership tracts and operating units are frequently dissimilar, this procedure provided only an approximate measure of the farm operating units that would be severed.

A review of the engineering considerations, traffic patterns, severance of ownership tracts, and disruption of farm buildings convinced location engineers that the north-south route along the western edge of Warren and Polk Counties, now the alignment for Route 35, was superior to its alternatives. Road-user benefit studies were not made in comparing the alternative routes. However, this procedure has been changed. A road-user benefit analysis is now made for each alternative alignment considered for a proposed highway. In addition, greater effort is made to measure cross traffic and to consider the barrier effects of the highway on such traffic movements.

Public Hearing in Highway Planning

Shortly after the route was selected, a public hearing was held to present the proposed location of Route 35 to interested parties and to explain the procedures to be used in constructing the highway. The hearing, which was held prior to construction, was the chief source of information for farmers about the proposed location of the highway. In addition, it seemed to be the chief means by which farmers and other local groups could express their views to the Highway Commission.

During the public hearing, a district engineer explained the general location of the segment of Route 35 and reasons for the choice of that location. 39/ Alternative alignments were not presented. Therefore, the discussion was limited to approval or disapproval of the Commission's proposed alignment. Although this procedure is still used in Iowa, it is not nationwide. Some States disclose the alternative routes for a proposed highway to increase the amount of useful planning information that may evolve from the public hearing. 40/

Some parties in attendance at the hearings indicated a desire for a second hearing after plans for alignment, interchange, and overpasses were more definite. However, only one hearing was held in each county through which the highway passed. The combination of a single hearing and the consideration of only one alignment at that hearing may have prevented some useful information from reaching planners. Recently, the Bureau of Public Roads recommended disclosure of alternative routes and use of additional informational hearings to make the public hearings more fact finding. 41/

The Right-of-Way Agents in Highway Planning

Rights-of-way agents who negotiate the purchase of property can also influence highway planning. While negotiating for rights-of-way, agents can pass along to design engineers requests by farmers concerning the location and design of certain structures. In the building of Interstate 35, this was done in one case. The raising of a culvert at the suggestion of a farm operator resulted in conservation benefits to the property owner and construction advantages to the Highway Commission. In a recent highway project, the transfer of information from farmers to highway engineers was both more direct and more complete. In this recent project, commission engineers, soil conservation technicians, and farmers met to correlate the soil conservation activities with the design of highway structures. The location and preservation of tile systems, the design and height of culverts, and the control of erosion were given special attention. Although new, this technique has resulted in substantial erosion control and drainage benefits to farmers and in savings in construction costs to the Commission.

39/ Iowa State Highway Commission, Transcript of Public Hearing held at Senate Chamber, Des Moines, Iowa, September 14, 1956; and Transcript of Public Hearing held in Board Room, Court House, Indianola, Iowa, September 28, 1956.

40/ Information is from replies to questionnaires submitted to the State Highway Departments of the 50 States by the Highway-Laws Project, Wisconsin Law School, University of Wisconsin, 1958.

41/ U. S. Department of Commerce, Bureau of Public Roads, Policy and Procedure Memorandum 20-8 (1), June 16, 1959.

Appraisal Procedures

The Highway Commission began appraising properties that would be damaged by Interstate 35 shortly after the public hearing was held. No advance contact was made with the property owner to indicate when his property would be appraised. Neither was the property owner informed in advance of the appraisal what procedures would be used or what types of information the appraisers would seek.

The appraisers were encouraged to give the property owner a chance to be present at the time of the appraisal. Further, they were instructed to spend enough time on the property with the owner to discover any obscure items of damage that would result from the highway taking. However, interviews with farmers indicated that a few right-of-way appraisals were made without the owner's presence or knowledge. When property owners were present when the appraisal was made, they were allowed to see the right-of-way plat maps used by appraisers. They were, however, informed that the plat map showing alignment of the highway through their property might not be final.

Owners who are not informed of the alignment of the highway through their property until the time of the appraisal may not have time to consider carefully the damage the highway may cause. For example, they may not have time to consider damages that might occur from isolation of a part of the pasture from a permanent water supply at the farmstead or from a temporary water supply, such as a spring or a small water-retention structure. A procedure that would give the owner some notice of the alignment of the highway through his farm prior to appraisal would be helpful to him in his consideration of obscure but legally compensable items of damage. Such a procedure would also assist appraisers to discover obscure items of damage that should be considered.

Of greater importance to the study reported is the fact that a procedure of prior notice would facilitate farm adjustment. It would allow both owner-operators and tenants to plan farm adjustments well in advance of land acquisition for the highway. A few of the operators of farms crossed by Route 35 indicated that uncertainty as to alignment of the highway delayed them in planning and undertaking farm adjustments. However, if right-of-way personnel are to provide property owners with notice of highway alignment prior to appraisal of the property, they need more time between completion of highway plans and the appraisal period. 42/

42/ Right-of-way appraisers are sometimes required by "letting deadlines" to make the "before" part of the "before and after" appraisal before the highway alignment is final. In such instances, they cannot tell the owner the precise alignment of the highway at the beginning of the appraisal.

As a recent policy, a booklet explaining highway planning and land acquisition is sent to property owners and operators along a proposed highway. 43/ This booklet answers some general questions about the appraiser and the right-of-way agent, the acquisition of property, the movement of buildings, and the nature and timing of payment to the property owner. It also encourages owners to ask the right-of-way agent any questions they may have.

Negotiation Procedures

After the appraisals were reviewed by the Commission and an offering price was established, a right-of-way agent contacted the owner. These agents, who were either Commission personnel or private land-buying agents, attempted to buy the needed land for the right-of-way. In no instance was the person who appraised the property the negotiator. The right-of-way agent indicated the amount of the offering price and the portions of it that were for land, fencing, and consequential damages. He also provided the owner with a general description of the items considered in the appraisal. This description gave the owner a listing of some major items of damage, such as the land, buildings, fences, wells, and trees to be acquired, and the damage to the rest of the unit that would result from the taking.

In attempting to buy property, the right-of-way agent had some freedom in the amount he could offer. For example, he could start his offer to the landowner below the price established by the appraisals. Likewise, he could carry his offer slightly above the appraisal price in order to settle with an owner who was holding out for a higher amount. This flexible price policy resulted in the purchase of land for the right-of-way below, at, or slightly above the prices initially established by the appraisals.

There was some mention of the actions of private land-buying agents and of the need for greater breakdown in the offer to show more clearly what items were included and the amount allowed for each. In general, however, owners seemed to be satisfied with the level of payment made for their properties by the Commission. This factor is significant as the level of payment influences the ease with which property owners can adjust their farm units.

The negotiation procedures used for this segment of Route 35 and those presently used by the Commission differ to some extent. The Commission no longer uses private land-buying agents as negotiators as many of them lack the necessary experience in acquiring highway

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43/ "Partners in Iowa's Biggest Business, Highways and Your Land," Iowa State Highway Commission, Ames, Iowa.

rights-of-way and, on occasion, they tend to antagonize property owners. Negotiators now use a more complete description of the items included in the appraisal and less breakdown in the offering price. A difference may be seen also in the pricing policy used by negotiators. The flexible price scheme used for Route 35 has been replaced by a strict one-price plan. This one-price policy, under which the negotiator is not allowed to deviate from the offering price established by the appraisals, is now used in most States. Of course, if the omission of a legally compensable item is discovered during negotiations, appraisal and offering price are changed regardless of the price policy.

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